UNITED STATES DEPARTMENT OF AGRICULTURE
AGRICULTURAL MARKETING SERVICE
WASHINGTON, D. C.

CONFERENCE
OF
AGRICULTURAL STATISTICIANS

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St. Louis, Missouri
March 21-25, 1938

The conferen ... ered was held in St. Louis, March 21 ... m the discussions were so voluminous ... ave the proceedings of the meeting publ ... decided to attempt their publication i ... ed in length, while retaining the main ...

This editing ... ivings by the undersigned, who realiz ... was willing to do so to get the papers ... speaker will agree with the editing done on his own speech, but it is hoped that each will approve the trimming done to the others! Such limited approval would be all that could be expected.

In any case the editor hopes to be given credit for good intentions; if the blue pencil had not been used, it is unlikely that these proceedings would ever have been published at all. A few papers were never turned in and one or two were lost and could not be replaced, so these could not be included. That is unfortunate, but it can not be helped.

After all, it is necessary to be more repetitious in a verbal discussion than in a written paper that can be re-read, so it is no reflection on these papers that they had to be reduced in length after their verbal presentation. Except for deletions, practically no changes were made in the original wording, and every effort has been made to retain all the main thoughts and ideas.

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1/ The papers by Mr. Anderson and Mr. Borum were inadvertently omitted at the time the other material was assembled, hence do not appear with the other A.A.A. papers.

THE AGRICULTURAL STATISTICIAN

by
Joseph A. Becker,
Principal Statistician, Washington, D. C.

* * * * * *

I see by the papers that the Statistician for the State-Federal Crop Reporting Service shows a big crop of wheat for the State, but a rather small crop for the United States as a whole. The other day he passed on a story from the Washington office about the world supply being a little below average. This looks like a good year for the wheat farmers here in the State. I wonder what sort of a chap he is and how he gets all the information that comes from his office.

For one thing, I know he must have an agricultural background of some sort. I don't mean that he must have been born and raised on a farm and be a graduate of an agricultural college. But he must at some time have rubbed elbows very closely with those on the farm. He must know on which side of the cow to sit while milking, and what difference there is in the functions of a plow and a harrow. Woe to his prestige if he should betray a lack of that intimate practical farm touch.

He must have that naturally acquired knowledge of the growing season which tells him which crops should be coming through the ground, which crop should be in flower, which crop ready for harvest, and which crop already taken from the field. Against this natural background he has opportunity to bring into play his ability as a keen observer. He must sense instinctively the lack of the usual plowed fields, grain drill marks, the healthy green of healthy growth, the golden color of natural ripeness, the full size and number of straw stacks.

Second in importance as natural equipment is his flair for just plain ordinary arithmetic. In other words, he must have "figure-sense." If he starts with 1,000 horses, has a birth rate of 4.3 per cent, in-shipments of 40 horses, a death rate of 10 per cent, and outshipments of 50 horses, he must know that his "figgering" will show at year end less than 1,000 horses. When he compares the computed average of a series or array of figures with the figures "en masse," he must sense instinctively that the computed average is a reasonable one. He must have that "figger-sense" of proportion that leads his eye to the spot on the sheet of figures where something is wrong.

No weakling is he, for he must on occasion put in long hours in office or field. Drought finds him driving in an oven-hot car where dust chokes him and heat waves flicker before his tired eyes; frosts and freezes find him inspecting orchards, truck farms, and winter grain fields; floods find him on river banks appraising the extent of actual and potential damage from the turbulent waters; and many a crop report date finds him afield from dawn to dusk, evaluating last-day changes not reflected in his correspondents' reports.

A versatile trained agriculturist is this crop and livestock estimator. It is not enough that he know wheat from rye in the bin. He must be sufficiently versed in agronomy to know varieties of all important crops, -- even to distinguish them in the field when passing at 30 miles an hour. Plant color and appearance, thickness of stand, stooling, root formation, and fruit development all have their significance to him with respect to probable yield.

He must be a horticulturist, too; know varieties of fruits and vegetables. Rural New Yorker potato, Globe tomato, Rocky Ford cantaloupe, Carmen peach, and Stayman Winesap apple must be recognized on sight. He must know enough of grades of dozens of these products to appraise potential marketings as well as production.

A plant pathologist of sorts must he be, -- to recognize wheat rust, smuts, wilt, blight, and their relative severity and potential damage. Apple scab, brown rot, peach yellows, and mildew are well known to him.

He is also an entomologist. Scale, aphids, chinch bugs, and army worms are all important in his monthly task. He must appraise the probable devastation from grasshoppers on the march, and track the wily boll weevil to his hiding place in the cotton square. Potential damage from insect and disease alike must be considered in the light of present plant development and subsequent weather conditions.

Should he be a meteorologist and weather prophet? No, but he must learn to appraise the statistics of weather--precipitation, minimum, maximum, and mean temperatures, humidity and sunshine. He must evaluate current weather phenomenon in relation to the season and in relation to the progress of crop growth. As background for this evaluation, he must have compiled the data for past years and surveyed their sequences and inter-relationships.

The agricultural statistician must also know his animal husbandry. Aberdeen Angus and Holstein-Friesian cattle, Poland China and Yorkshire hogs, Shropshire and Rambouillet sheep, are well known to him. He must know a car of feeders from a car of fat steers and a flock of Leghorns from a flock of White Rocks. He appreciates the significance of cold, wet weather at lambing time, the seriousness of an outbreak of hog cholera, and the effect of short pastures upon milk production.

He must understand the marketing processes whereby the products of farm and feed lot find their way into the busy flow of American life. Only in this way will it be possible for him to measure the relative adequacy of the reports which he prepares. Only in this way will he be able intelligently to arrive at a sound basis for the determination of average price, and the value of agricultural production.

As a member in good standing of the Bureau of Agricultural Economics, the agricultural statistician must also be an economist. He must be well grounded in the law of supply and demand, of diminishing returns, of opportunity costs, and kindred fundamental concepts. He must not fall into the traps of those who advance various and sundry

panaceas for curing the ills of agriculture and society, or advocate this or that specific for a current situation. He must keep informed of the attitudes and policies of the Bureau and Department on current economic problems and, on occasion, explain and expound those policies.

He must have a knowledge of the proper role of the crop and livestock estimating work and its relationship to the broader field of agricultural economics. He should neither over-emphasize nor under-emphasize its importance.

That he must be a trained statistician should go without saying. Since few schools are at present equipped to give him a complete training for this work, his first years with the Division must be considered as a continuation of his training. The fundamentals of statistical technique are the foundation upon which he must build. He must explore those further and newer developments which come to his attention,-- not because he must use all these in his daily work, but that he may appraise their possibilities for his work. Lacking that intimate firsthand touch with those in Washington or in the universities who are developing new uses and new devices for statistical analysis, he must be doubly alert lest he fall behind in his knowledge of his chosen field. He should make a date with himself once a week to spend several hours of office time on statistical explorations engendered by current published material.

Concerning his knowledge of all of these fields of work that mould him for his job, he must be humble and willing to ask questions, to learn and to acquire newer and more specific facts and theories.

The agricultural statistician must be a journalist and publicist. It is not sufficient that he determine the facts with respect to production. He must be able to write the story in an attractive and interesting form so that it will be read. He must avoid that trite, mechanical form, which overwhelms the reader in a maze of figures, and strive constantly for a newer and more interesting style. He must maintain his newspaper contacts by supplying information of interest from the Division and Bureau, not only at crop report time but throughout the month.

He must have the instinct of leadership. He has a corps of thousands of farmers to whom he is a definite personage of importance. He must stimulate their cooperation by functioning effectively as their advisor, friend, and leader. He makes them think with his interminable questionnaires, he impresses them with the seriousness of his work, yet he makes them smile with occasional droll, homespun remarks in his newsletters to them. He must win the loyalty and confidence of his assistants and office staff, so that the difficult and sometimes monotonous detail of office work will be done cheerfully and effectively. He must set an example of industry and efficiency and of patience in training his staff to the multitude of tasks now required in a field office.

Certain information upon which the statistician and the Crop Reporting Board depend must be gathered by the field man by 'phone, wire, or personal visit. The field man must maintain the necessary contacts with the right people so that the needed information is readily available. He must meet and impress the right people and maintain a friendly, but businesslike, relationship so that these sources of information will remain open to him. He should know and be known by all important persons

in the field of agriculture and related industries in his State, the college folks, the Department of Agriculture people, the agricultural editors, the leaders in the cooperative organizations, and important dealers in farm products.

Must he be a politician? Rather, let us say, that he must be a diplomat. It is not his function to lobby for funds for his or allied lines of work, or for an extension of his field of work. Yet he must at all times be prepared to present the case for agricultural statistics and their importance in a dignified and impressive manner before the proper persons. He should not be a smart "insider", but neither should he be so naive as not to know what is happening in agricultural circles in his State.

The crop and livestock statistician must be a psychologist of native and acquired keenness. He must know or come to know instinctively how much credence he shall give to the things he hears. He must be an interrogator of no mean skill and a winnower and sifter of information, oral or written, in order that inherent bias may be properly evaluated in reaching his final conclusions.

As in any line of work, private or public, the statistician must be a believer in his work. He must keenly appreciate the value of his work to the agricultural industry. He must have faith that the output of his office is overwhelmingly beneficial to agriculture and to society as a whole. He must feel that, with increasing accuracy and comprehensiveness, his work will become increasingly useful. He must be alert to discover new uses of statistics and new means of service.

The field man is loyal to his organization, to his Division, to his Bureau, his Department, and his fellow workers. When he has differences of opinion with the Crop Reporting Board in the matter of interpretation of data, he discusses these differences with the members of the Board and not with outsiders. The Board has been known to reverse itself in the face of a logical presentation of facts and arguments. His loyalty is evidenced by the high esteem in which he and his work are held in his State. He is a good soldier. With a shrug and a grin he reads belated instructions from Washington which will require a retabulation. He supposes there must be a reason for this or that arbitrary requirement, though it is confusing, incomprehensible and mysterious to him.

He "sees all, hears all, knows all." He is a walking information bureau. He is busier than a juggler with eight assorted balls in the air. Year in and year out, he turns from one report to the next with scarcely a chance between to breathe a sigh of relief over that job well done before beginning the new. He is a good citizen, though he hasn't seen a Fourth of July parade in years. In the middle of a tabulation, he must leave on a field trip, or go to Washington. All of these things distract him and prevent continued, concentrated, application to his technical problems. Yet he is forever surprising the Washington staff by developing new and better approaches to the problems of crop and livestock estimating.

Farmer, mathematician, agronomist, horticulturist, pathologist, entomologist, husbandman, meteorologist, economist, statistician, and journalist, he is above all a most rugged performer when the road is roughest. His greatest satisfaction is from work accomplished. His contributions to the development of the United States crop reporting work have been many and vital. The Washington staff of the Division and of the Bureau, engrossed in their problems, doubtless seem to take his efforts too much for granted. Deep in their hearts, however, they are constantly aware of their dependence and reliance upon him. They acknowledge his unfailing helpfulness and appreciate his contributions to the work.

(Editor's note: Mr. Becker could not attend the meeting because of illness, but sent this paper to be read. It was read at the closing session, but it seems most fitting here to present it first.)

AGRICULTURAL SCHEDULE 1940 FEDERAL CENSUS AND THE PRINCIPLES WHICH WILL GOVERN IT

Z. R. Pettet,
Census Bureau, Dept. of Commerce

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We are met this morning to discuss the results of the enumeration made with the Trial Agricultural Census Schedule. This innovation has been adopted in order that the coming Census may be as nearly complete and accurate as is humanly possible, and also in order that some of the advantages of an annual limited census may be illustrated. This schedule, following a long established precedent, was decided upon by a committee consisting of three representatives of the Department of Agriculture, three from the Census and one from the Central Statistical Board. This Committee considered many hundreds of questions including all those offered by various Divisions of the Department of Agriculture and the individual suggestions made directly to the Census.

Among the principles which determine the inclusion of questions and which we will discuss more in detail as we progress were:

1. Compliance with the law providing for a Census.
2. Carrying on an established series of statistics which have been found satisfactory.
3. Obtaining new information, or making changes where required.
4. Formation of a bridge to the old series.
5. The importance of the questions both in themselves and for carrying out the present governmental policies and programs.
6. The furnishing of a complete picture of crop and livestock production and value.
7. Clarity.
8. Idiomatic wording.
9. Convenience.
10. Avoiding controversy and unfavorable reaction.
11. Length.
12. Freedom from bias.
13. Interrelationship of various questions.
14. Records in local units of measure.
15. Mechanical adaptation.
16. Getting data not otherwise obtainable.
17. Conformity to past experience in regard to everything affecting the enumeration.

Most statisticians have found in their work that schedule questions have curious kinks and difficulties. The agricultural census schedule is no exception to this rule. Indeed, it probably furnishes an outstanding example of difficulties which may be encountered when an attempt is made to record the vastly divergent agricultural operations of a country the size of ours.

Before proceeding with the discussion of individual difficulties which arise and the principles which govern the formation of a satisfactory inquiry, it might be well to survey the limitations of the Census schedule.

These are very numerous. First are legal limitations which roughly describe the items that this Agricultural Division must cover. In 1935 these were in general, acreage, production and value of principal crops, numbers of principal classes of livestock, and quantity and value of livestock products. It will be seen that a narrow interpretation might result in as few as 30 questions upon the schedule, and the entire elimination of a great portion of information previously secured and demanded by many agencies.

Next are physical restrictions under which might be listed size and arrangement; then there are mechanical restrictions which perhaps are as important as the arrangement. Our present punch card and tabulating equipment prevent us from adopting the principal rearrangement of the schedule suggested by you. For example, it is necessary that items of farm value, taxes, population, etc., be in juxtaposition to the acreage questions, as it is impossible to have the questions reentered or transferred to the reverse side of the schedule because of errors, time, and cost. Similar limitations will be found in the transfer of certain items which logically belong together, such as value of automobiles, machinery expenditures and other items relating to automobiles.

Another limitation of the schedule is the fact that the information required must produce a fairly satisfactory total valuation figure, both of inventory items and production. We must secure this, as nearly one-third of our requests from commercial interests demand a dollar valuation be placed upon these items, not only by commodities, but by geographic units. This is also the primary foundation upon which some income studies are based. Next are the limitations of time and cost, which are imposed both by law and by convention. The Census period varies from two to three years, depending upon whether it is a five-year or ten-year Census, and the amount of money which is available varies in like manner. All of this brings us to our schedule keystone which is the number and difficulty of the questions possible within the limitations.

It is necessary for the Census to run the gauntlet of all the limitations before the principles that govern the schedule may be given adequate consideration. Reverting to our key point, the number and difficulty of the questions, most of you have found that beyond a certain number of questions the percentage of replies and even the accuracy suffer materially. Based upon experience of this kind, in 1935 we cut the number of major questions to 100, which appeared upon one side of the schedule. This compares with about 250 for 1930, not to mention the supplemental schedules, fruits, irrigation and drainage, incidental agriculture, etc.

In our proposed schedule it has not been possible to hold the questions to that number, extremely anxious as most of us have been to do so. Your comments indicate that you are heartily in accord with our attempt to shorten the schedule and that <u>your</u> recorded experience has been identical with ours. As many of you have mentioned the sign of weariness which the farmer emits with the turning of the schedule, the fatigue of the enumerator and of the farmer is perhaps the next most important consideration in determining upon a satisfactory schedule. It is just another phase of the number of questions, although fatigue is also induced by difficult questions which require a large amount of probing and leading questions. Another consideration which must be borne in mind is the

waning interest of a farm operator which results from a long series of questions. Usually the replies will be withheld, or they will be inaccurate, or they may be actually maliciously incorrect and the enumerator may fail to detect it.

Inventory items, i. e., those that may be actually counted and the record of acreage which also furnishes a visible evidence, are the items most easily obtainable. The replies to questions of this kind are free from many of the difficulties found in other inquiries, particularly that type of question which involves long calculations or a bookkeeping record. This is readily apparent from the replies from the statisticians who indicate that only four or five per cent reached in this enumeration, had book records.

It appears almost axiomatic that the questions should be non-controversial in nature because the enumerator is dependent upon the good will of the listener to furnish satisfactory answers. In the same general category with antagonistic attitude aroused by some questions is that of personal insult which some people attach to certain types of questions, such as some of those found under farm facilities (bath questions, for example). These run all the way from questions which farmers think out of good taste to those which he considers are nobody's business.

Another consideration connected with the personal attitude of the farmers is the memory limitation. Regarding items covering past years, farm operations, or expenditures, a great many people do not like to be harassed with probing questions such as how many dollars were spent for this and for that, and whether their personal taxes were included in such and such a paid or unpaid bill. They do not remember, and if they did, they do not care to discuss the matter in detail, particularly with some nosey neighbor. The next consideration is the misunderstanding of the question. This may be due to faulty wording of the questions, failure to use local idioms (corn-maize), or deafness or stupidity of the persons being questioned and sometimes that of the enumerator.

In all items which have to do with questions of personal or monetary nature, it is highly desirable that the confidential nature of the schedule be emphasized both upon the schedule itself and in the conversation and instructions of the enumerator.

The discussion so far has covered primarily the subject matter of the questions. There is another almost equally important and, to my mind, a very important aspect, and that is the general type of schedule, the arrangement, the display, the proper separation of the blocks and questions and the position in which they appear, the order in which they will be listed, etc.

The separation of the blocks is extremely important. In 1930 we found many enumerators who consistently placed returns in the wrong block because of faulty eyesight, bad light, haste or other causes. Two-color display improves this factor and upon this we have depended in an attempt to avoid block and position errors. The form of the schedule itself is more or less conventional, and while it may not be the best form that can be used, it is admirably adapted to mechanical tabulation, which is one of our limitations and considerations.

As you have noticed, the present schedules have two marked differences from those which have been used in the past. The first of these is a simple regionalization; the second is the color display for each block . In discussing the regionalization it may be said that it must conform to certain mechanical requirements and the plan used is the only one which does. In adopting the tentative regionalization plan the primary factor was the crop set-up. We have not yet found it possible to make regionalization of farm facilities and livestock questions, although it is possible that something of this kind might be done. The net gain offered by the current regionalization is the eliminating of about 35 useless questions in areas where crops are not grown. This saves time, fatigue, and cost, and improves accuracy. This regionalization can be carried considerably farther and we hope to make further progress in line with certain recommendations of the statisticians.

The second principal innovation is the overlay of skeleton lettering in red which is designed to overcome one of our greatest difficulties, that of position errors. The printer has the overlay in too bright a color and one inch too far to the right, which results in some of this red ink in the column intended for recording and also partially obscures some of the questions. This is a matter which will be readily corrected on the next schedule.

To emphasize the necessity of avoiding position errors, we call attention to the cardinal difference in the tabulation of this material and the tabulation of schedules upon which estimates are based. In your work it is possible to discard any extreme or unsatisfactory schedule when making an estimate, but when making a Census tabulation we are required to use every bona fide schedule if it is physically possible to do so, otherwise the enumeration would not approach completeness. When you realize that there are nearly 7,000,000 schedules and 200 major questions on each you see that you have opportunity for 1,400,000,000 or more position errors and that this becomes an outstanding difficulty.

In touching upon the points in this discussion only a few of many thousands have been mentioned -- very much less than 1 per cent of the difficulties which we meet with in census enumeration. In your field work you have encountered many of our old difficulties and perhaps discovered several new ones. Your reports have enabled us to pick out the most serious objections to the present schedule and your constructive criticism should enable us to improve it greatly. There will doubtless always remain a wide difference of opinion on many of the points encountered, but probably you realize, as we do, that it is necessary to work constantly upon the schedule with an open mind and all the best knowledge and help available to obtain satisfactory results.

A new viewpoint may sometimes help us greatly. On the other hand, biased or unfair criticism may have bne opposite effect. We believe it is distinctly advisable, however, for your statistician and ours to get together and to cure the difficulties which occur in the statistics of either service.

A summarization of the reports of the statisticians has been prepared and also a list of the difficulties encountered and the errors made. As it required thirty days of intensive training to teach our area supervisors the difficulties in connection with the schedule, it is readily apparent that only the briefest sort of reference could be given in a twenty-minute discussion.

We are happy to have had the opportunity which has been offered us and are doubly appreciative of the cooperation extended to us by the Division of Agricultural Economics and the individual statisticians.

COMMENTS OF STATE AGRICULTURAL STATISTICIANS RELATING TO TRIAL ENUMERATION

W. B. Jenkins,
Census Bureau, Washington, D. C.

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Following the suggestions contained in C.E.M. #540, the field statisticians sent in detailed reports covering their findings and suggestions for improvements in the schedules. The comments contained in these reports are presented herein in summary form. No effort has been made to include ideas of any members of the Census Bureau. Nearly all of the state reports showed careful and intensive thought and, combined, they give to those interested in agricultural schedule-making a wealth of material concerning enumeration and other field difficulties.

Deep gratitude should be expressed to the Department of Agriculture and particularly to Mr. Callander and his personnel for their assistance and fine spirit of cooperation in accomplishing this test of the proposed schedules. A number of the statisticians stated that they now have a keener appreciation of their own problems and of the reaction of reporters to their own schedules. Some also stated that they are in a position to make a more satisfactory appraisal of the results secured either by mail questionnaires or by field enumerations.

GENERAL SUMMARY

Arrangement and Make-up of Schedule

Arrangement:

With few exceptions a rearrangement of the sections, and in a few cases, of some of the questions within a section, has been suggested. The most frequent suggestion was to place Section XIII (Individual Crops Harvested) contiguous to Section III (Uses of Land), this being desired to facilitate securing a figure for Question 13 (Land from which crops were harvested) which would be in conformity with the acreages of the individual crops harvested after making due allowances for interplanted and succession crops.

It was also the consensus that the preferable arrangement is one which will bring about the least resistance on the part of the farmer. Thus, questions on income, expenditures, values, mortgages and taxes should be placed near the close of the schedule. Someone has commented that after wading through a series of perplexing questions, the mere turning over of the schedule sets up further resistance and therefore if the questions which are easily and quickly answered are on the first page of the schedule, the results would be more satisfactory.

Several pointed out that experience will teach the enumerator the best order to ask the questions, even holding to the present arrangement. One seemingly wise suggestion was to have a small blank space on the schedule reserved as a work sheet.

Block Titles:

The few comments which were made relative to the superimposed red block names suggested their elimination or that they be placed in smaller type and in a position where they would not interfere with the reading of questions or the entering of data.

Length of Schedule:

The general comment was that the schedule is too long, as the farmer and the enumerator both become weary. The length referred to here usually meant "time consuming" as it was generally recognized certain questions such as facilities in house could be answered about as rapidly as they were asked. However, the large number of questions crowds them to such an extent that the enumerator is prone to enter his information in the wrong block or on the wrong line.

New Questions or Additional Information:

Most frequently desired are questions relating to soil improvement crops and information for follow crops and for acreage and production of irrigated crops. Difficult to know whether land devoted to soil improvement crops belongs under Question 13, 15 or 16. Questions on the schedule which now appear as a grouping for several crops are desired to be broken down in individual states to get some crop that is widely grown in that state; for example, broomcorn in Missouri and Illinois and cotton in New Mexico. Also desired additional information concerning livestock not on farms and farm-to-market roads.

Substitution or Elimination of Questions:

Frequent suggestions were made that the questions on nonfarm income and value of home garden be eliminated, perhaps to be replaced by different type of questions. Nearly all of the statisticians commented on the unreliability of annual production and sales of the dairy items and production of eggs. A number suggested that these questions be supplanted by ones dealing with current production and sales.

Several suggested that some of the questions lend themselves to sampling and not to a census type of enumeration. There was some disagreement, however, as to the type of information which should be obtained by sampling. For instance, some thought it should be information easily obtained, such as the age of operator, whether work animals are furnished by the landlord, relationship of tenant to landlord, and number of automobiles, etc., whereas others thought it should be information difficult to obtain, such as nonfarm income, expenditures, production of milk and eggs, etc.

Attitude of Farmers

Comments varied widely as to whether the farmers were willing to furnish information. Only a very few enumerators reported many refusals. In numerous cases the general comment was that the farmer was willing to cooperate after the purpose was explained. In several cases where there was hostility, it was apparently due in large measure to the farmer's having been pestered on numerous occasions with recent surveys. It was frequently reported that the farmers were very hesitant to give answers to the inquiries which they knew little about, for example, values and milk and egg production. The nonfarm income questions invariably aroused resentment, this being reported as particularly true in those cases where there was considerable income or where the operator was a farmer only secondarily.

Enumerators and Enumeration Procedure

Because few records are kept by farmers, many of the statisticians appreciate that the controlling factor in securing an accurate census is the caliber of the enumerators. Particular stress was placed on the need of careful training, good intelligence, and an inquiring frame of mind. It was held that there should be no measurement except fitness, training, and ability. It was frequently suggested that a rather intensive period of schooling be given to the supervisors and enumerators and also that the enumerator's work should be checked at the completion of his first few schedules and returned to him, with a record of the errors, for correction.

Maps

When any comment was made, it seemed to be the opinion that the maps which were furnished are not up-to-date and that in many cases maps were already in existence which were better suited for census work.

Reliability

Only a small per cent of the operators keep records. Those who do not keep records make guesses or refuse to answer. Some of the guesses were very wild, particularly for the economic items and for some of the production items. Most reliable are the answers for specific questions such as inventories of livestock, acreages, kinds of facilities, and the like. Intangibles, such as value of land and buildings, value of products sold, laborers hired on historical dates, milk and egg production, etc., were not answered so well. The psychological effect of asking these questions was detrimental to the other questions. Much aid for these items was required of the enumerator, so that enumerator's bias is bound to be present. Records were most frequently referred to for taxes, though acreages where measured under Agricultural Adjustment Administration programs and production of certain crops such as cotton, rice and any grains where threshing records were available were often known through having records.

Wherever a new operator was encountered, there was difficulty in knowing whether the inquiries referred to the operator and his

operations of the previous year or to the operator and the farm he was then on. It was found that a member of the family other than the operator could not give information as easily as the operator. Exception was made for poultry and milk production and value of gardens, when the housewives often supplied more reliable answers than the operators.

Since the schedule is too long, farmers became tired toward the end, reaching a zone of diminishing cooperation and accuracy.

Most of the farmers were entirely unprepared to give data. Some of the unreliability might be eliminated through advance knowledge of the enumeration.

Supplemental Schedule

The supplemental schedule which is required when there are two or more tenants for a landlord brought forth varied comment from the enumerators in southern territory, for which it was particularly designed. For example, one said that a supplemental schedule would cause a lot of grief if a general schedule for each operator is required, and that in its present form it causes more trouble than it is worth, though he admitted it was useful for tax and mortgage data. He further reported that it is an imposition to ask the owner detailed information about each tenant.

Another reported that the owners agreed that the tenants would be able to give data no more accurately and probably not so well as the owners. He said the tenants were diffident, unfamiliar with acreage and production, and unsatisfactory as a source of data. He also stated that the supplemental schedule furnishes a satisfactory record of operations and serves as a check against individual farms given subsequently, and concluded that the schedule should be more compact and that information should be secured for several more crops and for hogs.

Time or Season of Enumeration

Only the enumerators in Colorado, New Mexico and Ohio commented on the month in which the enumeration could be made most advantageously. These three gave their preference as January since farmers are easier to contact at that time, which is usually a slack season for farm work. Also, that month precedes the usual moving date for farmers.

Time per Schedule

The amount of time required for the enumeration of a particular farm varied considerably according to the type of operation, cooperativeness of the farmer, and the aid which the enumerator gave to the listing. If good work is done by the enumerator, the average time spent with the farmer needs to be in the neighborhood of 1 hour, after all preliminaries, requiring 5-15 minutes, are over. One enumerator gave his range as from 10 to 40 minutes, while others gave their range

from one-half hour to 4 hours. Most were of the opinion that from 6 to 10 schedules per day should be the range when efficient work was done. Several reported 12 schedules as their maximum.

RESULTS OF THE TRIAL CENSUS

Hilton E. Robison,
Census Bureau, Washington, D. C.

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You have no doubt been wondering what use is being made by the Census Bureau of the schedules which you, as enumerators, secured in connection with the 1938 Trial Census of Agriculture.

Your work in using the schedule for obtaining the desired information from the farm operators has shown some of the difficulties of the schedule as it relates to the various sections of the country. The Census Bureau is now engaged in editing and tabulating the schedules submitted in order that the results may be analyzed. The procedure followed is as nearly that which would be used in a regular census as is practicable. The schedules are edited, the data transferred to punch cards, and the results tabulated from the punched cards. Thus, the trial census permits a trial of the office procedure as well as a field trial of the schedule. In addition to tabulating the edited returns the difficulties encountered are also noted and summarized.

The work of tabulating and summarizing the returns has not advanced sufficiently for any crystallization of conclusions based upon the tabulations of the results. You, the statisticians who cooperated by making this trial enumeration, can be of material assistance in the analysis of the results for your states. The summary schedule for your state will, when completed, be available to you upon request.

These summaries, though not necessarily representative, give a cross section of the agriculture within each state. They will permit the statistician to view and appraise the results of his work. Viewing the results from the standpoint of totals and averages, the statistician with first-hand knowledge of the area and of the farms enumerated has a distinct advantage when it comes to an appraisal of these results. Appraising the trial schedule on the basis of the totals secured presents a somewhat different point of view from that of enumerating individual farms. Possibly the totals or averages of certain items which appeared dubious from the standpoint of individual schedules might indicate that the errors in judgment on individual schedules tend to average out. Or, items which appeared satisfactory when viewed from the standpoint of individual schedules may not look so well in total. Therefore, it is hoped that an appraisal of each of the state summaries by the statisticians in that state may result in further constructive suggestions regarding the schedule and instructions which should be provided the enumerator.

CONCLUSIONS DRAWN FROM ENUMERATION OF THE 1938 TRIAL CENSUS IN MINNESOTA

Paul H. Kirk,
Statistician, Minnesota

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To consider the U. S. Census, or any other census, as final, or even as a base from which no flexibility is allowed, is an iridescent dream. The dependability of a census lies in the fact that it comes very close to being a sample of the universe and therefore is quite representative, but above all, with such a large enumeration, the two laws, namely, law of averages and law of compensation, come close to working perfectly.

In taking up the question of field crops, there is much that can be said, but with the traditions back of the U. S. Census as to the manner of selection of supervisors and enumerators, I am fearful little can be accomplished. I would say that the most constructive thing which could be done is to allow the Census Bureau to carefully select its supervisors and enumerators with only one object in view: their experience and fitness for these responsible positions. Political pressure should be removed.

I readily understand that this is a census for the whole United States, but primarily must draw the majority of my conclusions from years of experience in Minnesota. However, on a U. S. basis, I feel certain that it would not only lessen the work of the enumerator but pave the way for a more accurate enumeration if all of Section XIII, including regional crops (001 - 023) would be placed just before Section III - Farm Acreage. In nearly every case I found that it was unwise to try to have the farmer answer the questions in Section III before he has answered the individual crops and these totaled up. Considering the importance of the livestock, poultry and dairy statistics, I would suggest they immediately follow the questions on crops.

I would suggest that there is no particular reason for asking "wheat and flax mixed." This custom of seeding wheat and flax is not now being used to any extent and would shorten the schedule and allow some definite questions on "mixed grains." I feel sure more dependable data could be secured if the census schedule was so worded and instructions issued to both supervisors and enumerators that when "mixed grains" are reported this mixture should be stated on the schedule. To illustrate: if a farmer reported 30 acres of succotash or mixed grains, the report should, if the mixture was wheat and oats, plainly show that of this 30 acres 15 were wheat and 15 oats, or whatever the mixed acreage. As the question now reads, when tabulated it is necessary to reallocate this "mixed grains" to the proper crops. The U. S. Census gives us no clue along this line.

As the U. S. Census asks for harvested acres, it is presumed you get harvested acres, but that depends entirely on how the enumerator asks the question or follows it up. The enumerator goes to a farm, sits down with the farmer and starts taking the census. He comes to, say, wheat or oats and asks, "How many acres of wheat did you have?" He may or may not stipulate "harvested." The farmer, particularly since the Soil Conservation began subsidizing farmers, naturally thinks of all his acres. Unless the enumerator is careful he may get a planted acreage rather than a harvested acreage. In other words, the farmer knows his production better than his acreage.

In conclusion, I will state that any census, U. S. or state, is just as good as the individual enumerators, and the one thing the United States cannot have is personal contact year after year with enumerators. This is a serious drawback but no one is to blame. As I said in the beginning of this article, the laws of averages and compensation do work in these enumerations and thereby make them as reliable as possible under the present method the Census Bureau must conform to in the selection of its supervisors and enumerators.

1940 CENSUS -- DAIRY AND POULTRY ITEMS

Henry M. Taylor,
Agricultural Statistician, Virginia

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The dairy and poultry items on the Census schedule are most difficult for the farmer to answer accurately. Our experience in taking the 1937 trial census showed that only 2 out of 68 farm operators could answer milk production accurately. We found that most farmers, when asked the production of milk and eggs during the preceding year, immediately said that it was impossible to answer, and requested the enumerator to make an estimate based on what other farmers had reported. The operator then had to be assisted in making an estimate, and this required considerable time and patience.

The results of the previous census reports indicate that both milk and egg production as reported on the Census schedule are influenced by the time at which the enumeration was made. For instance, the 1930 Census, which was taken as of April 1st, indicated a much larger production per cow and per hen than shown by the 1925 and 1935 Census reports, which were taken as of January 1st. The farm operator, undoubtedly, is influenced in making his estimate by the production at the time the question is asked. He immediately thinks of the quantity of milk or the number of eggs that were produced yesterday or during the preceding week and then proceeds to estimate for the entire year upon this basis.

Commercial dairymen and poultrymen apparently are able to answer these questions fairly satisfactorily, and for this reason the questions on sales of dairy products seem to be easier to answer than the questions on production. The accuracy of Census reports probably varies from State to State. In the important dairy and poultry States the production figures are probably fairly reliable, but in the non-commercial areas they are largely guesses and are generally the enumerator's opinion rather than the operator's. Unless the enumerator is very conscientious he will soon find that it is much easier for him to suggest a figure than to attempt to have the farmer work this out for himself.

We realize the difficulty of wording these questions in a practical manner and in a way which will secure accurate results. Our experience in taking the trial Census, and also working with the Census Bureau, convinces us that the present questions will not secure accurate figures for milk and egg production. We suggest the following changes in the wording of these questions:

Cows Milked, Milk and Butter, 1939

1. Total cows and heifers milked yesterday.
2. Milk produced yesterday.
3. Average annual production of milk per cow for all cows milked during 1939.
4. Total number of cows and heifers milked during all or any part of 1939.
5. Butter churned, pounds.

Poultry

1. Chickens over three months on this farm on January 1, 1940.
2. Hens of laying age on this farm yesterday.
3. Chicken eggs produced on this farm yesterday.
4. Average annual production of chicken eggs per layer during 1939.
5. Total hens of laying age on this farm during all or any part of 1939.
6. Chickens raised in 1939, whether sold, consumed or on hand.

The operator will be able to answer accurately the questions on the number of eggs and milk produced yesterday. The average production during the year will be a rough estimate, but such an estimate on behalf of all farmers who have milk cows will give a fairly accurate figure for each county and State. The answer to the question on total number of cows and heifers milked during the year will probably not be accurate, but a comparison of this figure with the number of cows milked yesterday will be very helpful in determining the number actually milked. The Census Bureau or the Department of Agriculture can then estimate total production.

The same comments apply to the questions on chickens and eggs.

We admit that these questions are not entirely satisfactory. It may be possible to secure the number of cows and milk production quarterly on the first of each of the following months: January, April, July, and October. However, our experience in getting answers to the question on the number of farm laborers on the first of these months was not very satisfactory. We strongly recommend that before the 1940 Census schedule is finally decided upon, a trial of these questions be made either by mail or by visiting farms.

THE AGRICULTURAL SCHEDULE FOR THE 1940 FEDERAL CENSUS

(Recommendations for improving the 1939 schedule based on field trials)

H. A. Marks,
Statistician, Florida

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FRUITS AND VEGETABLES

If the Trial Census schedule which was used in January had contained questions on fruits and vegetables like some of those used for the 1930 Census, my task would be easier because there would be so many improvements to suggest. The present schedule has, to a large extent, corrected the mistakes of 1930 and earlier years and I find more to commend than to criticise in the present schedule which was used in the trial enumeration.

No comment is needed on the acres and production questions on fruits.

It might be an improvement if a grouping of all Florida fruits and nuts might be made under a regional classification which would permit leaving out apples and cherries which are occasionally planted by misguided immigrants from the north but which will not thrive and produce edible fruit in Florida. Of less importance under Regional Crops is the inclusion of some crops such as quinces and English walnuts which are almost unknown in Florida, and I assume the same thing has occurred in some other states. It is hoped that these little-grown crops can be removed from the schedule and other crops more important in the state can be substituted.

The questions relating to vegetables are much the same as those in previous inquiries. Acres and value of crops are asked as in previous enumerations, which brings up the question: Why ask for production of corn, peanuts, apples and pecans, but no value, while for the vegetables, value is asked but not production? For twenty years Crop Estimates has been collecting production figures for truck as well as staple crops and fruit. Prices have been collected by schedule and daily reports from terminal markets and field stations of the Fruit and Vegetable Division furnish check prices fully as good as those for the fruit crops. If quantity rather than price is of the most importance for staple crops and fruits, it should be most important for the vegetable crops as well. It is true that vegetable crops, especially those grown during the winter months, are subject to greater hazard from frost and water damage than other crops, but tying up the reported acres with a definite production should be an aid to accuracy in getting acres harvested. Vegetable crops are sold in the field, at the packing house, f.o.b., or delivered, graded and ungraded, packed and unpacked. Any statement of value is bound to be more or less indefinite unless there is some way of knowing what is

included in the reported value. The trial enumeration did not shed much light on this problem. Some growers remembered the amounts received more readily than quantity sold, while others began with quantity and figured about what they received. If quantity had been asked rather than price, it is doubtful if the average grower would be able to report on this item any more readily than on price received. It may be true, however, that reported quantity multiplied by estimated price in known units might give a truer picture of value than the reported value of indefinite meaning. And you would have quantity, whereas now you have only the reported value. Is there a valid reason why price rather than quantity should be asked for vegetables as has been done in the past, or is it merely following a precedent established when the vegetable industry was unorganized and the Census enumeration was the only way to get any approximation of the value of these crops?

This still leaves the question of truck crops in the south. For beans, peppers and similar crops, planting begins in the fall and may continue into the spring. It is likely that the grower of such crops will report for a crop rather than calendar year. Fortunately, the greater part of the harvesting takes place after January 1, so that while this problem exists, in most years it probably does not affect the state acreage and production to any great extent. It is easier to state the problem than to suggest a cure. Comparability with previous years must always be considered and any change suggested for truck crops may not be of sufficient importance to outweigh this factor.

THE CENSUS OF LIVESTOCK JANUARY 1, 1940

F. K. Reed,
Statistician, Colorado

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Fundamentally, the difficulties inherent in a Census enumeration are primarily those resulting from incompleteness of enumeration, and the possibilities of duplication which may result if extensive efforts are made toward obtaining a complete enumeration. Where livestock is run under range conditions, especially in the case of sheep where the animals of a single ownership are held in bands located in different counties, or even in different states, the matter of contacting the right people who are in a position to give authentic information is an essential consideration. By comparison with these fundamentals, the mere matter of classifying the animals becomes very elementary. Since the amount of space to be devoted to livestock items is limited, and the questions appearing on the sample schedule used this year cover the subject fairly well, no recommendations are being made for either additions or deletions.

MAKING THE ENUMERATION IN RANGE TERRITORY

Where animals (particularly sheep and cattle) are handled under range conditions, the reliability and completeness of the Census enumeration will depend very largely on the amount of preparation which is made in advance of initiating the enumeration. As the first item in preparation, I would suggest obtaining from the records of County Assessors a list of names and addresses of sheep owners appearing on the tax rolls. This procedure was followed in connection with the 1930 Census, and if I am informed correctly, this resulted in probably the best enumeration of sheep ever made in the Western range sheep states. I understand this procedure was not followed in connection with making the 1935 Census enumeration, and the degree of completeness and the reliability of the classification of sheep was of questionable accuracy.

While some additional expense would result from making these advance preparations, the amount should not be large. The problem could be handled by setting up offices in the range sheep states several months in advance of the beginning of enumeration. The person in charge would probably need one secretarial assistant in each area. This person could correspond with County Assessors and make arrangements for obtaining these lists of names of owners of sheep and cattle.

Without advising that the procedure be followed, but rather for the sake of opening up the question for consideration, I might suggest that this Area office then undertake to actually make the enumeration of these larger bands of range sheep -(these might be termed nomadic bands). I am not sufficiently familiar with the Census Bureau proce-

dure to discuss in detail how such an enumeration, if made, could be coordinated with the general enumeration. That is, how duplication could be eliminated, or how it could be worked into the general listings from the primary enumeration. Much of this special enumeration work could be done through the mail, probably with use of a special sheep schedule, together with a special letter and special instructions covering the sheep enumeration problem. Naturally, if this special procedure were followed, additional instructions would have to be given to enumerators doing the general farm to farm work.

Unless the range sheep enumeration is given special treatment, an incomplete enumeration and questionable classification is certain to result. Let us presume that a general enumerator encounters a band of sheep wintering on a farm operated by a person other than the owner of the sheep. The owner of this farm knows roughly how many animals are on his place. He does not know the classification nor would he know the number of sheep which had been shorn during the previous year, nor the pounds of wool shorn. Some rough indication of the classification of the animals could be obtained from the herder in charge but these herders would not have the shearing information. A general enumerator would encounter these problems and others which it is probably not necessary to list. It is recognized, to be sure, that use of the special enumerator would add additional complications in the way of possible duplication with the general enumeration and any general incompleteness in the special enumeration. Weighing the evidence, however, would lead to the conclusion that better results would be obtained through use of advance preparation and special enumeration than through failure to use a procedure based on this method. Possibly a modification of this method would be better, namely, one of obtaining the list of names in advance and furnishing of this list to the general enumerator.

It is believed that the procedure of distributing Census schedules in advance, as was done in connection with taking of the 1935 Census, was a decidedly forward step in making the enumeration. This was unquestionably helpful, not only as related to the livestock portion of the schedule but also as related to the schedule as a whole. As related to livestock specifically, this procedure tends to tie the numbers to the date January 1, and materially speeds up the work of the enumerator. As related to the general enumeration, it might be mentioned here that all enumerators should be especially urged to mention the fact that inventory numbers of livestock should give numbers on January 1.

Suggestions for a livestock enumeration would not be complete without mention that special consideration should be given to enumerating animals in feed lots, both commercial and private. Our analysis of previous Census enumerations indicates a general incompleteness in the enumeration of animals in feed lots. There are possibly three principal reasons for such incompleteness: (1) Marketing and deaths of animals between January 1 and the date of enumeration; (2) Failure to contact all farmer feeders; (3) Failure to contact commercial feeders such as railroad feeding yards, and other large feed lot operators who do a large amount of feeding on small areas.

I have not dealt with such items as those concerning milk production, egg production and chickens raised. It seems hardly necessary to deal with them here, except to say that unless each enumerator is ingenious in his methods of bringing out the facts as related to these problems and painstaking in sifting the evidence, items of this nature will tend to be very largely rough estimates.

As a major premise of this discussion I have urged special procedure for obtaining a complete enumeration of livestock, particularly sheep being run under range conditions. In connection with the 1930 Census, the Crop Estimates organization did this preliminary work almost entirely.

I feel that my report would not be complete if I did not suggest that the Census Bureau follow this procedure independent of the Crop Estimates organization, so far as the action end of the program is concerned.

SPECIAL CROPS: THEIR ENUMERATION UNDER THE 1940 CENSUS SCHEDULE

H. F. Bryant,
Statistician, Kentucky

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The enumeration of special crops brings to its sharpest focus what is really one of the most essential points of the entire Census, both for these crops and for all other questions, i.e., careful and competent instruction of enumerators and a following through by the district supervisors to see that the instructions are followed. Without this, the enumeration of special crops would be a farce.

Because of the fact that they are special crops, and therefore somewhat unusual in frequency of occurrence or in classification, they are much more likely to be incompletely or inaccurately enumerated. There is nothing that will take the place of a careful drilling into the enumerators the fact that after all ordinary crops and other questions have been covered, every producer should be carefully asked whether he harvested any other kind of crop or product. Very often the enumerators themselves are not accurately familiar with the production of special crops and with what farmers are producing them, even in the enumerators' own localities.

It is not inappropriate that I should say I am speaking not only from experience as a statistician but from experience both as a census district supervisor and in making actual field enumeration. I have observed where the failure to give the enumerators such instruction, and to see that these instructions were properly executed, have caused material errors. This is not offered as destructive criticism but in the frank spirit of helpfulness, in trying to get the most accurate data that can be gathered.

The enumeration of some of the special crops also brings in the question of how much willful bias may now exist among farmers in the desire to obtain more profitable bases, and makes necessary the careful re-checking of acreages when filling out schedules. On the other hand, it often is probable there may be a downward bias due to farmers' desire not to report acreages or production over their bases or allotments, for fear the data so given might be used as a check on their other figures. In other words, the task of the census enumerator and of the census district supervisor is now more difficult and more exacting then ever before.

These generalizations may be applied to all special crops in all states, but in our particular state (Kentucky) our major cash crop, tobacco, is classified as a "regional" crop. In the handling of the enumeration of tobacco data there is one very great need that has not yet been met, as the sample schedule is printed. In our state, the lumping together of all the six distinct types of tobacco is just

about as logical as it would be to lump all grains together and simply ask acreage and production of "Grain Crops." Our six types of tobacco are different in variety, different in growing, different in curing and marketing, and different in the uses that are made of them, and in the channels of trade and geographical areas of consumption to and through which they move. For that reason it is very much needed, and I hope it may be found possible, to have the enumerators identify, by one of the six type names, the tobacco production and acreage.

I think the statisticians here will agree with me that it is more difficult to make satisfactory estimates, and, in many cases, more difficult to unravel from the census data satisfactory analyses of minor crops than of major crops, on which there are ample data.

For these reasons I respectfully urge that every possible effort be made to impress upon the enumerators and the district supervisors the absolute necessity of handling the data on special, or regional, or minor crops with extra care and precision.

ECONOMIC QUESTIONS ON THE 1938 SCHEDULE OF THE TRIAL CENSUS

Frank Andrews,
Statistician, Utah-Nevada

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The questions considered in these comments are those numbered 21 to 66 on the Census schedule. These economic and social questions were answered for the 50 farms covered by the trial enumeration in Utah as readily as were the other questions. Such resistance as was encountered in Utah applied to the entire inquiry. This resistance consisted of complaints rather than refusals to answer questions; complaints due sometimes to a feeling of annoyance at being asked so many questions and at other times due to a fear that the information would be used for taxation purposes.

None of the questions covered by these comments seem to need rewording in order to make them effective in Utah. It is recommended, however, that instructions to enumerators include explanations and warnings concerning certain questions.

The questions concerning total value of the farm and value of buildings involve the usual difficulty of the farmer appraising his own property. The enumerator should note the difference between the value of the entire farm and the value of the buildings and compare the land value thus computed with the reported acreage in the farm and the probable value per acre. Also, the difference between the value of the buildings and the value of the farmer's dwelling house should be noted and the difference compared mentally with the other buildings on the farm. Also, the amount of mortgage debt should be compared to the valuation of the farm. Other items may be checked roughly by comparing the reported figure with other figures on the schedule wherever practicable.

The answers to the question on non-farm income, amount expended for forest products, hardware, etc., and possibly, also, the total expense for farm labor may contain considerable error unless the farmer has some kind of a record. The error might be due to a considerable number of small items composing the total, items of irregular expense which might easily be overlooked or might have occurred in a preceding year and be remembered as for the year in question. For such items as the purchase of automobiles or such seasonal purchases as for seeds, plants, trees and fertilizer, possibly the farmer's memory would be fairly dependable. The Utah fruit growers enumerated in the trial census apparently kept in mind the cost of their crates and boxes when they reported on expenditures for forest products.

The enumerators should be warned that the number of days of farm work by hired laborers reported for question #48 should be the sum of the days of all laborers. The Utah enumerator had one instance of a

misunderstanding. Two men were employed for 14 days each but the schedule showed a total of only 14. The amount of cash reported for the 14 days indicated 28 days should have been the answer.

Another difficulty which the enumerator may overcome is the estimating by the farmer of the total days worked by fruit pickers and similar laborers who are paid by the unit of product harvested and not paid by the day or hour. A number of commercial fruit growers in Utah declined to estimate the number of days of hired labor but did give the total amount paid for such labor. The enumerator who called on these fruit growers did not suggest to the farmer how to estimate the number of days. Had he been a regular enumerator, he should have been instructed to go back and try to get a fair estimate.

ENUMERATOR BIAS IN CENSUS DATA

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Research Section, Washington, D. C.

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It is generally agreed by agricultural economists and statisticians that further improvement in the reliability of state assessors' enumerations and the Federal Census of Agriculture will have to come largely from a more efficient field enumeration. The Social Science Research Committee on the Census of Agriculture made this statement: "Except as the coverage has been complete and the questions correctly answered and recorded in the field, no amount of efficiency in editing, coding and tabulation can produce a satisfactory census."

An analysis of dispersion in assessors' or Federal Census data for a county known to be very homogenous often shows an unreasonable amount of variation in yield per acre of crops, ratios of crops to land in farms or crop land, milk and egg production, and in other items. An examination of individual schedules for questionable counties reveals that some enumerators reported crop failure on practically every schedule, and others in the adjacent townships made no entries for this item. A high percentage of the returns in one enumerator's district will show a yield per acre of corn of exactly 20 bushels. The majority of the schedules in the adjoining minor civil divisions will be an even 30 bushels. Egg production in one district will be consistently reported at three dozen per hen per year as compared with four, five or six dozen per hen for adjacent districts with similar farm flocks. Milk production often shows the same inconsistency.

Enumerator bias in many cases obscures the actual spread between townships, and the change from one census to the next. The source of bias unless controlled by the schedule or the enumerator seriously affects the reliability of any enumeration for minor civil divisions or other small geographic areas. For some items, the data by states are of doubtful value because of this factor. A study of enumerator bias suggests four primary causes of this source of error, namely: (1) Manner in which the questions are asked; (2) Assistance given the farmer in answering the questions; (3) Data supplied on the basis of enumerator's judgment; and (4) Omission of items. Each of these factors is discussed separately.

Manner in which the questions are asked:

The difference in interpretation of definitions for particular items often accounts for the change in one township from one census to the next. The definition of "land in farms," "idle land," "crop failure" or any other item involving classification may not mean the same to any

two enumerators. On a given farm we find crops grown in combination with other crops, with the rate of planting and width of rows varying between fields; partial harvesting of fields for different uses of the crop. Fields that have been idle from one to many years; pasture varying from open to woodland; and many other classification problems. Any item that is not definite within itself but is dependent on definitions for comparability should be carefully studied. Unless the enumerator understands and follows all the definitions, rules and regulations, the information he obtains will not be comparable with the data obtained by other enumerators. A question should be asked as written and modified by the essential supplementary instructions applicable to the area. Thought should be given to developing "clear cut" questions while interviewing the first few farmers. These unbiased questions will shorten the interview and keep the farmer from losing his patience. Carefully planned enumerator schools, after the enumerators have had an opportunity to study the schedule and to enumerate a few trial schedules, would serve to minimize the bias resulting from misinterpretation of definitions.

Assistance given the farmer in answering questions:

The items on a Census schedule may be classified, with respect to the ability of the average farmer to give immediate and reliable answers, into three groups. The first group includes items that involve no estimation or memory on the part of the farmer. Water piped into the bathroom, farm on electric power line, number of tractors, work-stock and similar items indicate the characteristics of this group. The second or intermediate group involves memory but very little estimation. Many of the items require for answers definite quantities as of particular dates during the year. Naturally the average farmer's memory becomes hazy as to these figures from one to twelve months later. Examples of this kind are: acreage of major crops, measured production of certain crops, and livestock as of January 1. The third group of items involves both estimation and memory on the part of the farmer. Noteworthy examples of this classification are: milk produced during the past year, butter churned, eggs produced, chickens raised, and production of certain crops.

For the items in group one, the enumerator can ask a straightforward question and record the answer as given. If the question is asked correctly, there is no chance for enumerator bias to distort the information. The difficulty in enumerating items in group two, relating to fairly definite quantities but involving memory on the part of the farmer, varies with individual farmers. One farmer will have records to which he can refer or he may have a good memory and easily recall the acreage of wheat harvested or the number of livestock on January 1. Another farmer, on the other hand, may be completely at sea in trying to recall these data. If the enumerator waited for an unassisted answer from a farmer with a poor memory, it would take several hours to enumerate one schedule. Most enumerators soon learn that it is necessary for them to develop a technique for obtaining the desired information from farmers who have poor memories.

The enumerator should always ask a straightforward question and give the farmer the opportunity of making an unassisted reply. If the farmer is perplexed and shows no sign of being able to answer the question, the enumerator should then come to his rescue to avoid loss of time and the farmer's good will. This assistance should always come after the farmer has failed to answer the question. A definite answer should never be stated as a part of the question asked; for example, "You had about 10 acres of cotton?" or, "You made about 20 bushels of corn to the acre?" In most cases the farmer's reply will be "yes" to this type of question. This type of assistance-approach accounts for a high percentage of the consistency in acreage and yields within townships and of the dispersion between townships.

If assistance has to be given, it should be done in such a way as to eliminate entirely the influence of the enumerator. Instead of using one method of assistance for all farmers, the enumerator should use several approaches in prompting different farmers and thereby give the law of averages a chance to minimize bias. If a farmer is unable to recall the number of hogs he had on January 1, one approach would be to build back from the number on hand at the present time by adding the number sold, killed, or that had died, and deducting the number born and purchased since January 1. Of the next farmer who needed assistance on this item, the enumerator could ask if he had more or less than a figure that would be a <u>maximum</u> for the capacity of the farm. If the farmer replied "less," the enumerator should gradually lower the estimate in consecutive order until the farmer calls a halt. In giving the next farmer assistance on this item, the enumerator should start with the same type of question based on a <u>minimum</u> indication for the farm, and proceed to increase until the farmer is in agreement. Additional variation in assistance for this item may be obtained by using a direct approach in estimating total hogs on hand on January 1 in one case as compared with estimates built up on the basis of the different age groups. Assistance can be given in estimating production in four ways, namely, (1) using the maximum approach on production; (2) using the minimum approach on production; (3) using the maximum approach on yield per acre times acres; and (4) using the minimum approach on yield times acres. Assistance given in estimating corn production before asking for acreage would add additional variation in the approaches available and help eliminate constant bias on the part of the enumerator.

Items on a Census schedule that involve both estimation and memory are more subject to enumerator bias than items in the other two groups. As a rule, farmers have had no reason for making estimates of milk and egg production for the year, value of farm garden vegetables and similar items. The enumerator's questions, therefore, catch the farmer totally unprepared, and if he does respond, the information given may be a wild guess unreasonably low or unreasonably high. In this case the figure should be questioned to see if the farmer understood the question. If, by asking the question in more detail, the farmer's reaction is not changed, the estimate should be accepted, provided it is not outside the range of physical capacity. Serious bias can result from questioning only high figures, or, on

the other hand, only low figures. If the enumerator questions estimates that appear reasonable, he may inject his own opinion in the enumeration and thereby bring about serious bias in the results.

A high percentage of farmers will be unable to give an immediate answer to the items in this classification. In this case the enumerator will have to assist the farmer, using the technique previously given. The enumerator should avoid using only one method of assistance; for example, multiplying the estimated daily average production of milk by the number of cows milked during the year or the estimated average daily production of eggs times the average number of laying hens kept during the year. This method could be used on one farmer and the maximum and minimum total-production approaches used on other farmers. Another approach would be to build up a production estimate based on possible uses of the product, e.g., Egg production could be eggs sold, consumed in the household and used for hatching. The number of approaches that can be used will vary with the items to be estimated and with the amount of assistance required.

Data supplied on the basis of enumerator's judgment:

Many enumerators get the idea that since they have to make the estimate for a farmer, it is better to supply the information on the basis of their judgment than to lose valuable time. Enumerators come to this conclusion after they have struggled with a few impatient farmers who are able to answer directly only a few items. For all other items these farmers are perfectly willing to accept any estimate the enumerator may suggest. If the enumerator makes the estimate without the benefit of the farmer's judgment, the results are the same whether supplied at home or in the presence of the farmer. Adequate training in methods of enumeration, and proper supervision, would reduce this type of bias to a minimum.

Omission of items:

Practically all enumerators make the land-use items balance or add up to the total land in farms by omitting the question "all other land in farms" and supply this as a remainder figure. Although this practice probably does not give a bias as between minor civil divisions, it eliminates a valuable check on the other land-use items. If this question were asked, the farmer would have an opportunity to adjust his estimate for some other item, perhaps incorrectly given. The failure to ask for total livestock, when a derived total can be obtained by adding the number by sex and age groups, often gives a slight bias. Farmers may duplicate animals in two age groups and the sum of the breakdown may exceed the definitely known total for the species. The total and the component parts should always be asked independently. In this way the enumerator can give the farmer the opportunity of making the two check. Some enumerators get in the habit of asking only a limited group of questions on the schedule. No question should be omitted if there is any probability that the farmer has the commodity mentioned in the question. A study of the schedule will show the questions that may be omitted in case the farmer gives a negative

reply to a certain earlier question; e. g., it would be unnecessary to ask the question on milk and butter produced if there had been no cows milked on the farm. Some items are applicable to all farms and should never be omitted.

PROBLEMS OF ASSESSORS' ENUMERATIONS

Irvin Holmes,
Agricultural Statistician

* * * * * *

During the last three months of 1937 Messrs. Whittier, Brewer, Warner, Shaw, Baldwin, and myself worked with assessors' data for nineteen counties in the States of Indiana, Wisconsin, Minnesota, Iowa and Kansas. This field work, which was done as a part of the Sample Census Research Project, involved the interviewing of assessors, AAA community committeemen, and other local people in order to match up three year identical farms for the period 1935-37. In all, nearly forty thousand farms scattered over two hundred seventy-nine minor civil divisions, were covered in this work. When the field work had been completed, each of the above men was asked to submit a report on the assessors' census reports for the States in which he had worked. What I have to say here today will be in part a summary of the views of these men.

No system of enumeration is perfect and the only way to make progress in any line of work is to frankly admit the defects and set about developing a method for eliminating them. An appraisal of the weaknesses of assessors' enumerations is particularly timely at present in view of the possibilities of a regular sample farm census, and the need for county estimates in connection with the administration of the AAA programs.

Incompleteness:

The matter of completeness of enumeration, together with its corollary -- comparability as regards completeness between successive enumerations -- is one of the most important, if not the most important problem, in connection with a farm enumeration. In general, the incompleteness in the assessors' enumerations falls into three categories: (1) omission of entire farming units, (2) omission of parts of farming units, (3) omission of specific items on the schedule.

To hold this trouble to a minimum, the ideal procedure would be to make the enumeration an historic one, to be taken as soon after harvest as possible. This would mean November or December for the Corn Belt States. The two next most important causes of incompleteness are "non-resident operators" and "inability to see operator on first call". There is an all too common feeling among assessors that the farm census work is an added duty for which they are not receiving due compensation. A few of them frankly stated that their reports represented only the farms that they could secure without undue expense, time, and trouble.

Three other factors contributing to incompleteness are: (1)"lack of a system of accounting for all farms or farm land," (2) "failure to transcribe data from slips to record book," and (3)"refusal of data by operator". In a very few instances we found assessors who had made maps to check their coverage for assessment purposes but the majority depended entirely upon their memory. Occasionally assessors record the crop data on a slip of paper and transfer it to their record book later. The possibilities of error through this procedure can easily be imagined. Not only is there the chance of omitting the entire farm, but countless possibilities of errors in copying, as well as the likelihood of omitting items listed in the book which the assessor might not call to mind. Only a few assessors admitted that they were unable to secure the data from the operator. Reported changes in size of farm often are found to be not bona fide, that is, part of the total land in farm has been omitted in one or more years. The average assessor has a somewhat different conception of what constitutes a farm than that defined by the United States Census. The assessor tends to think in terms of ownership tracts, but the manner in which he takes the census may vary between an ownership and an operating unit basis. The omission of rented land in combined owner-renter cases is probably the most common error of this type. In addition there seemed to be some misunderstanding regarding the handling of cross-county and township line farms. Different assessors handle the matter in different ways and the same assessor might even vary his practice between years.

The nature of our sample census study was not such as to give us any very accurate indication of errors caused by the omission of items on the schedule. However, there seemed to be a definite tendency toward the omission of rough land and pasture land in some States, particularly in years when the real estate assessment was not made.

In addition to the above causes of incompleteness there was the personal factor of the assessor himself. The majority of the assessors had not had the farm census "sold" to them. The record books carry a statement on "Uses of Agricultural Statistics and Crop Reports" but this impersonal presentation does not take care of the matter. If the man collecting the information does not know why he is collecting it nor how it is to be used, how can we expect to get accurate results? Closely related to this is the fact, already mentioned, that many of the assessors do not feel they have any definite obligation in connection with this work.

Duplications:

We are generallyso concerned with getting a complete enumeration that we spend little time worrying about duplications. However, sometimes they do occur and the chief causes, as we found them, were: (1) between members of the same family, (2) between landlord and tenant, (3) because of the combining or dividing of operating units, (4) as a result of misunderstanding as to the proper handling of cross boundary line farms, (5) because of changes in operator. In general,

duplications appeared to be relatively unimportant from the standpoint of affecting the accuracy of the entire enumeration.

Methods of Enumeration:

Most states follow the United States Census procedure of enumerating all farms according to the location of the operator. For the sake of brevity I will designate this as the "Operating Unit Method". In Iowa, however, the reports for all boundary-line farms are broken down according to the townships and counties in which each tract of land is located. This I am designating as the "Land Unit Method".

In view of the importance of this problem it might be well to list some of the apparent advantages and disadvantages of each method. The Operating Unit Method is simple and is the one that would naturally be followed by an enumerator. For this reason it should be the cheapest and quickest plan as well as one that would make for the least number of errors. Also the Operating Unit Method is that used by the United States Census and comparability in this respect is highly desirable. Finally, in the majority of cases the boundary-line overlap cancels out so that the accuracy of the county figure may not be affected by this method. The Operating Unit Method, however, does not afford any accurate check on coverage of total crop acreage, or land in farms for a given geographic unit such as a county or township. Even though a system were devised for accounting for all of the "regular" farms, as, for example, by the use of maps showing farmstead locations, there would still be no check on the coverage of non-resident and absentee operators. This is an important factor, particularly in the "suit-case" farming areas of the Great Plains.

The Land Unit Method would, theoretically, give a reasonably good basis for checking the completeness of the land coverage but the apparent disadvantages are numerous. It seems fairly obvious that it would increase the cost of the enumeration considerably, in proportion to the additional accuracy secured. The procedure is more complicated, which increases the possibility of other errors. There is also criticism because of duplication of work when two assessors visit the same operator. This fact certainly should not be overlooked.

Mr. Shaw has suggested a third Combination Method. Under this plan the assessor would enumerate the farms of resident operators, including only the land which fell entirely within his Minor Civil Division. These farms would be listed in the first part of his record book, showing the location of the land by section as well as the name and address of the operator. The assessor would enumerate separately all tracts of land located outside of his Minor Civil Division which were farmed by residents of his Minor Civil Division. These reports would be listed in a separate section of the record book and each report would show the location of the land (by county and township) as well as the name and address of the operator. Finally the assessor would list (but not enumerate for individual crop items) the tracts of land within his Minor Civil Division which were farmed by non-residents. The reports on

these tracts would show the name and address of the operator, the location of the tract, and the total acres. When the record books were edited and added in the State office the second and third tabulations for all townships and counties would be cross-checked and the data for cross-line tracts transcribed. Two totals would then be available for each county:

Tabulation 1 + Tabulation 2 = Operating Unit Method

Tabulation 1 + Tabulation 3 = Land Unit Method

Such a method should give an automatic cross-check for all cross-line cases. This plan has the merit that the only extra work involved for the assessor or enumerator is that of separating the tracts. He does not have to go outside of his Minor Civil Division to contact non-resident operators, and the criticism of duplication of work and expense is thus avoided.

There will be some serious objections to this method. In the first place the matter of separating the farms is left to the judgment of the enumerator. It may seem that there would be little chance for error in this, but I can foresee where different enumerators would not follow the same policy in splitting cross-line tracts. There would also be the possibility of assessors failing to return the correct name and address as well as the correct total acreage for the tracts farmed by non-residents. Furthermore, the volume of clerical work in editing and cross-checking the reports would be considerably greater under this system. However, the whole question of method of enumeration as it affects the problem of completeness is one that merits our serious attention.

Schedule Content:

The matter of schedule content requires only a few comments. One thing that did attract my attention was the arrangement of the individual items. This appears to be a carry-over from the set-up of the Division's acreage questionnaires. In other words, the first question is <u>total land in farm</u>, followed next by questions on individual crop acreages, and finally by questions on land utilization, such as <u>acres in plowable pasture</u>, <u>acres in other pasture</u>, <u>idle land</u>, etc. Where a questionnaire is being filled out by the farmer himself and the items are in vertical order such an arrangement is logical and has the merit of focusing attention on the need for cross-checking against the total land in farm figure. I am not so sure that this reasoning holds true where the figures are entered by an enumerator and where the items are arranged horizontally across the sheet. For this reason I would be inclined to give consideration to an arrangement of items more nearly in line with that used by the United States Census. That is, to follow the all land in farm question with a block of several simple questions on land utilization (including pasture land and total crops harvested) so designed as to cross-check the all land figure and to give the

assessor an all crops figure to work toward in enumerating the individual crops. The matter of securing all-inclusive and comparable figures on all land in farms will be even more important if this item is used as one measure of completeness of enumeration through any system of farm or land identification.

This brings me to the desirability of including three items asking for the section, township and range numbers for each farm. This plan was used in the Indiana State Farm Census in the spring of 1937 and Mr. Justin has devised a rather ingenious system for handling township plat maps to be used with these data in checking coverage. In this connection the question always comes up as to what the section numbers refer; that is, the location of the farmstead or the location of the bulk of the land in the farm. In Indiana we observed a tendency, although not very marked, for assessors to split farming units along section lines.

There appears to be some question about the advisability of extending the number of questions beyond that which can be placed across one page, usually about thirty. In Wisconsin the plan of rotation questions or staggered items has been used. In 1935 the Wisconsin book carried five columns on milk utilization, in 1936 this space was devoted to land utilization items, while in 1937 it was used for population by age groups. This plan of securing increased coverage deserves wider usage.

Analysis of Assessors' Data:

As now collected the assessors' reports are used by this Division largely as sample data, and rightly so. There are two avenues of approach to the problem of analyzing assessors' data in the estimation of crop acreage. The first involves building up, or equalizing the data to 100 per cent. These adjustments, which are generally made on a minor civil division basis, may be worked from two different angles. Under the first method, the data for a minor civil division may be adjusted on the basis of the change shown for adjacent areas. Changes in land in farms, crop land, pasture, and individual major crops, all should be taken into account. This method is logical provided the enumeration in the adjacent areas is reasonably complete, and provided the areas are homogenous enough so that such an analogy is justified. The principal danger under this procedure is over-adjustment because of excessive smoothing of the data geographically.

Another method of adjusting for incompleteness is based upon comparisons of numbers of farms, land in farms, and other items, enumerated for the same minor civil division in previous years, either by the assessors' census or by the United States Census. While such a study may indicate the range of possible completeness, it hardly gives an adequate basis for estimating the degree of completeness in any given year. The danger here is that the data may be smoothed excessively with respect to year-by-year changes. For example, if the true change in number of farms and land in farms is sharply downward,

reliance on this procedure may easily result in an under-estimation of the decrease in farming operations. The practice of making adjustments on the basis of averages per farm enumerated is open to particularly serious criticism. Where there is a material shortage in number of farms enumerated the logical assumption is that those farms for which reports have been returned are highly selective, as for example on the basis of accessibility. This invalidates the assumption that the size of farm and crop ratios for the omitted farms are comparable with those reported by the assessor.

Where the assessors' reports are materially incomplete the adjustment approach is inadvisable. In such cases the only alternative is to utilize the reported data as a sample for measuring year-to-year changes. This necessitates the computation of ratio-relatives; and the matching of identical farms if the number of reports is comparatively small and sufficient clerical help can be secured. Such a method also involved a frank recognition of the need for developing independent objective measures of year-to-year changes in the amount of all land in farms or total amount of crop land under cultivation.

Conclusions:

I have purposely presented the dark side of the picture first. In the field work on this project our contacts with the assessors were generally very pleasant and everywhere we received splendid cooperation. The errors which I have mentioned are presented not in the light of horrible examples, but rather as what can and does happen in otherwise good enumerations. Their effect upon the accuracy of the totals is probably less than a recital of them would indicate.

Many of the weaknesses of assessors' data are undoubtedly inherent in the system. We cannot expect too much of data which are secured as a by-product. The possibility for material improvement in assessors' data appears to lie largely in increased and more detailed personal supervision. This would require increased personnel and funds, but it is not impossible of achievement. A system could be set up whereby a certain proportion of the counties, say one-fourth or one-third, could be covered each year, immediately prior to the time of the enumeration. In addition provision should be made for more frequent contacts with the weakest counties, and with new enumerators as needed. Such visitations should be used for holding schools of instruction, answering criticisms, and "selling" the farm census to the assessors. A plan should be developed for checking the work of each assessor, both as regards quality of work and completeness. Personal supervision of this type has a psychological advantage that can never be approached by the impersonal "mail-order" type of instruction.

SAMPLE CENSUS AND PARTIAL CENSUS

Charles F. Sarle,
In Charge of Research Section

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The Bureau of the Census and the Bureau of Agricultural Economics have a joint responsibility in supplying agricultural statistics. The Federal Census, taken every five years, is essential as a "periodic bench mark" in the making of annual estimates of crop acreages and production, livestock numbers and production, farm income, and many other items. We have to depend on the Census for other economic data as well. There is a practical limit, however, to the number of items that can be included on a Census schedule.

Sample Census to Increase Scope of Agricultural Statistics:

One way to provide periodic information -- items needed only once in several years -- would be to take a sample census of, say, 25 per cent of the farm. Our research to date indicates that a representative sample of 25 per cent of the farms would have sufficient precision, with items occurring on the majority of farms, to justify building up the sample to approximately 100 per cent completeness by States, crop-reporting districts and type-of-farming areas.

Sample Census and County Estimates:

There is an increasing demand for annual estimates of agricultural production and farm income by counties. We cannot furnish reliable county estimates on the basis of the present voluntary sample of farm returns. Reasonably reliable county estimates could be made, however, for items found on the majority of farms on the basis of an annual sample census of identical sampling units properly tied into the regular Census enumeration. The size of the sample would depend on the nature of the items for which annual estimates were to be made and the degree of precision desired in the estimates of such items.

An Annual Sample Census Program for Intercensal Years:

No doubt some of the economic items now included on the trial census schedule for 1940 could be transferred to the Sample Census schedule, thereby relieving the load and improving the reliability with which the remaining items would be enumerated.

The plan is simple. Select, say, 160 economic items that are most needed and for which periodic estimates would pretty well meet the more pressing needs. Divide these 160 items into groups of 40 items each.

Place the first group on the 1940-41 Sample Census schedule along with, say, 60 items for which annual estimates are needed, making approximately 100 items in all. For 1941-42 take the second group of 40 economic items and the same 60 items used the first year, approximately 100 in all. For 1942-43 take the third group and for 1943-44 the fourth group, using the same 60 each year. At the end of the fourth year the 160 economic items would have been covered once and the 60 items on the continuing part of the schedule would have been obtained each year. The annual Sample Census schedule would have been held to approximately 100 items each year.

Partial Census for Commercial Truck and Fruit Crops:

There are two essentials in making reliable annual estimates of the production of any agricultural commodity. The first is a reliable periodic bench mark (Census) that provides the base for annual estimates. The second essential is a representative and adequate method of sampling to obtain year-to-year changes in acreage and production.

Twenty years ago carlot shipments of fruit and truck crops furnished both an annual bench mark and a year-to-year check on the estimates of the so-called "commercial" production of the highly localized specialty crops. In recent years the increasing use of motor trucks as carriers of all agricultural products over long distances and especially of the fruit and truck crops has made the carlot shipment data practically valueless as a measure of commercial production of these specialty crops.

Census Method Inadequate:

Only 5 of the 22 special vegetable crops estimated by the Bureau have been included in each of the last four censuses -- cabbage, strawberries, sweet corn, tomatoes, and watermelons. Only 7 of the 30 fruit and nut crops estimated currently by the Bureau have been included in each of the last four censuses. None of the 5 seed crops estimated currently were included on either the 1924 or the 1934 Census schedule. Broomcorn and hops, strictly commercial crops, have not been included by the Census since 1919.

A "Partial Census" of the townships and counties growing these commercial truck and fruit crops is badly needed today, using a special schedule designed to meet the problems of succession crops, fruit trees and production by age groups, varieties and methods of sale and disposition. A Partial Census of this kind, taken every five years, would supply a reliable periodic bench mark so greatly needed if the forecasts and estimates of some 22 truck crops and 30 fruit crops are to be made more accurate.

Sample Census vs. Partial Census:

The annual Sample Census is to be distinguished from a Partial Census. The former is taken each intercensal year as a ______ per cent sample from all the farms, presumably in all agricultural counties of the country; whereas the Partial Census is taken periodically -- once in five years -- in a selected area and covers all the farms in that area (county or minor civil division, as the case may be).

The size of the annual Sample Census, as well as the extent of the Partial Census (number of counties covered), would depend on the degree of accuracy required inthe annual estimates for a particular agricultural crop.

The first step is to select the counties producing appreciable quantities of commercial truck and fruit crops for sale beyond county boundaries. Preliminary work along this line suggests that some 250 counties in the United States produce more than 80 per cent of the 22 commercial truck crops and that 250 to 300 additional counties produce about the same percentage of the fruit crops. The amount of overlapping of these two groups of counties has not been determined. We are safe in saying that approximately 500 counties would give us 80 per cent coverage. If greater accuracy in the data is desired, more counties or parts of counties would need to be included.

Sample Census Research:

Research to date has been along two different lines -- first, to determine comparative administrative costs of alternative methods, and, second, to determine the statistical reliability and accuracy of alternative methods.

Administrative Costs:

A study is being made of the cost per schedule and per item of taking the long 1930 Federal Census Schedule and the short 1935 Schedule. A similar study is being made of the costs and methods used in connection with annual State farm censuses taken by the local assessors. Furthermore, in Alabama, where an annual sample census including only a small percentage of the farms in each county has been taken since 1927, four different methods of sampling were tried out in October 1937 to determine comparative costs. This test will again be made in 1938, when an attempt will be made to obtain the same farms as were taken in 1937. The four methods of sampling used were --

1. A route sample, with the number of farms an enumerator could take in one day as the sampling unit.
2. A section sample, with the number of farms having their farmsteads within a section of land the sampling unit.

3. A section sample, with the land falling within the boundaries of a section forming the sampling unit, and with livestock taken for each farmer interviewed.
4. The individual farm sample, -- the individual farm selected from local assessor's tax rolls.

With all four methods, the sampling units were selected according to the principles of stratified random selection. Our hypothesis is that the first method, the route sample, will have the least cost per farm and that the individual farm sample will cost the most per farm. We are interested in knowing how much more expensive.

Design of Sampling and Statistical Reliability:

A study is nearly completed to determine the usefulness of the minor civil division or township as a sampling unit. Our tentative conclusion is that a sampling unit as large as a minor civil division is not practical for sampling a county where county estimates are the goal. The minor civil division, however, might be used as a base for district or area estimates of items generally distributed among farms, where such areas include 10 or 15 counties, provided a sample of at least 25 per cent could be obtained. Such a sample would necessarily be taken in the same minor civil divisions each year.

A study is under way in 19 counties in Indiana, Wisconsin, Minnesota, Iowa and Kansas (States having annual assessors' census), to determine --

1. The statistical accuracy of a stratified random sample of farms falling within 4-section blocks compared with a route sample of an equivalent number of farms selected by judgment of the statistician, using soil maps and other information.
2. The comparative statistical efficiency of three different sizes of sampling units stratified by townships and randomized. These units are:
   (a) Farms having farmsteads falling within 4-section blocks;
   (b) Farms having farmsteads falling in blocks of four separate single sections;
   (c) An equivalent number of individual farms.

A study is under way, using 1935 Federal Census data for Morrow County, Ohio, to determine the comparative efficiency of the different sized sampling units:- A single farm; two farms together; 4 and 8 farms along a road or adjacent. This test is being made on the basis of stratification and nonstratification of farms in the county. The farms have been stratified, first, along the main highways, second, about centers of population, and, third, along less important highways or

byways. The third category has been further subdivided into three classes on the basis of the soil-type.

The results of this analysis indicate that from 30 to 50 per cent more farms would be needed to give the same precision if they were taken in groups of eight adjacent along a highway, than if the sample were farms taken singly at random.

A study of farm data obtained from an aerial survey made by the A.A.A. for a few counties also is under way. This is part of a study to determine the best way of using such data as a basis for county estimates, which includes the problem of sampling the nonparticipating farms.

This brief statement furnishes some idea of the problems on which the researchers on sample census methods are attempting to throw some light. When legislation is enacted providing for a partial or sample census in intercensal years, the results of this research will permit an intelligent and efficient attack on the practical problem of obtaining sample data that can be used as a means of increasing the scope, obtaining greater geographic detail, and improving the accuracy of agricultural data.

A SAMPLE CENSUS IN INTERCENSAL YEARS

H. H. Schutz,
Statistician, Louisiana

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There is urgent need of additional county agricultural data between census years. The need is not only for accurate information on changes in crop acreage and production and numbers of livestock, but for data relating to income, taxation, prices, etc. A simple method which may be found to be applicable to acreage changes will most probably also be applicable to a more comprehensive program. Whether a 5% or a 25% sample is necessary to secure county representativeness can only be determined by research and by experiment under field conditions. And the problem resolves itself into the formation of a practical method of selecting and enumerating a group of farms within each county that is primarily simple as well as economical of application, and which at the same time will provide a sample sufficiently large to give representativeness and stability.

So far, practically the only state-wide experiment in the United States with a sample farm census on a county basis is the one attempted in Alabama. Until recently, the procedure there has been to enumerate 150 to 200 farms per county each year, the enumerators being instructed to list successive farms on roads radiating from a central point. The results obtained were unsatisfactory because the same farms were not enumerated each year, thus making it necessary to employ the ratio relative method, and because the "land in farms" factor lacked stability.

The extensive work being done by the AAA in compiling farm statistics offers valuable material which should furnish the basis for a sample farm census. For several years, this organization has been collecting crop information on millions of the nation's farms. Every fall, the bulk of all farm operators fill out a Report on Performance on the acreage of the principal crops they have planted. These reports are made out in triplicate in the county agent's office, and it is probable that the AAA would be willing to authorize the making of a fourth copy for transmittal to the statistician.

Inasmuch as work on these performance reports is begun by October 1, there would likely be enough of them available by November 1 to constitute a fair sample. They could be mailed to the statistician at the close of every week. From the AAA state office the statistician could secure the serial number of all work-sheet signers, if this is desired, and the percentage completeness could thus be determined for each township.

For the current year, for instance, the procedure would involve having access to the individual performance reports for 1937 and to match these with the 1938 reports as they are received. It is possible that a 25% sample might be utilized in this manner if time and office help are adequate.

The 1938 performance forms have probably not been printed yet and perhaps the AAA could be induced to agree to a slight modification of the questions asked in the past. The addition of a few items to the form would thus furnish the basis for computing the county acreage changes of the principal crops. If it did not involve an undue amount of extra work in the county agent's office, an extra column for crop production would add much to the value of the data. Likewise, a few questions relating to numbers of livestock would be of great service.

An alternate method of inestimable value, if it could be put into practice, would be to supply the county agent's office with forms similar to the Supplemental forms recently devised for use in the trial census of the Census Bureau, these to be filled out only by farm owners at the time they visit the county agent's office for the purpose of filling out their performance forms. This would entail no extra work on the part of the county agent who would merely be asked to forward the forms to the statistician when they have been completed. On this form would appear items on acreage and production of the principal crops and numbers of livestock on hand. The farm owner would be asked to give the totals for the entire farm.

COUNTY ESTIMATES OF POTATOES IN NEW ENGLAND

C. D. Stevens,
New England

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We are doubtless all in agreement as to the desirability and usefulness of county estimates of potato production. However, it is questionable if these estimates can be prepared for all counties from the data now available with a sufficient degree of accuracy to permit their widespread use. The discussion of these estimates here is limited to the situation in New England and it is my sincere hope that other states present a more satisfactory picture. In New England the enumeration of crop acreages by assessors has never been established and estimates of crop acreages and yields are largely dependent upon the standard survey methods used by the Division of Crop and Livestock Estimates.

County and state estimates of potatoes may be regarded as having two phases, acreage and yield per acre, each of which may be examined on two bases, the historic and current. A considerable part of this discussion will be devoted to state estimates because it is only when reasonably accurate state estimates become an accomplished fact that county estimates have a possibility of approaching a useful degree of accuracy. Circumstances permit us to study the period from 1929 to 1934 on both the current and historic basis. This is due to the fact that before the 1934 Census became available and because of the then impending Warren Act, county estimates of potato acreage, yield per acre, and production based on a careful consideration of available data were prepared for the period 1929 through 1934. Recently a new series of county estimates for this period, based on the revised state estimates, was prepared for the use of the AAA.

Considering the 1934 estimates of acreage as prepared currently for the Warren Act, we find that out of sixty-seven counties only eight have acreage estimates within five per cent more or less than the Census acreages for the same counties which were released later. If the range is increased to ten per cent above or below the Census totals, the number of counties will be increased to seventeen, which is still not a very large proportionof the sixty-seven counties involved. It is probable that this apparent accuracy in these counties, outside of Maine, is mostly chance when it is noted that the original state estimates of potato acreage in 1934 were below the Census totals from 1% to 20%. Deviations of the original estimates made in 1934 prior to the release of the Census acreages show a very wide range, varying from 70 per cent below the Census total in Barnstable County, Massachusetts, to four times the Census total in Suffolk County, Massachusetts. Neither of these two counties is

important agriculturally. However, the preliminary estimates for several fairly important potato counties show deviations twenty-five to forty per cent more or less than the Census acreages. For New England as a whole, in fifty of the sixty-seven counties the original county potato acreage estimates were below the acreage later available from the census.

In the preparation of county estimates of potatoes for sixty-seven counties over a period of five years, a total of 335 separate estimates of acreage, there are 90 separate estimates of the change in acreage which fall entirely outside the probable changes as indicated by two to five available indications. These indications in most cases left a very wide range for possible estimates. Well over one-fourth of the entire group of estimates can be criticised in this way. The estimates in forty-eight of the sixty-seven counties were forced to levels above or below available data from one to five times in preparing the five year series. Part of the reason for these difficulties lies in the increases shown by Census potato acreage from 1929 to 1934 which for the various states were as follows: Maine, 4 per cent; New Hampshire, 43 per cent; Vermont, 33 per cent; Massachusetts, 92 per cent; Rhode Island, 100 per cent; and Connecticut, 90 per cent. While there is doubt but that potato acreage gained materially in these states during this period, it is equally certain that the 1929 Census enumeration was far less complete than the one secured in 1934.

Just one or two illustrations willsuggest the seriousness of this problem. When it appeared that the 1929 Census was quite incomplete, special Census surveys were conducted in five selected towns in Maine and three towns in Massachusetts, while in Connecticut special records secured by Dr. I. G. Davis furnished similar comparisons for twelve towns. The towns surveyed in Maine had 61 per cent more farms in 1930 than were found by the Census a year earlier, in Massachusetts the towns surveyed showed 9 per cent more farms, and in Connecticut 15 per cent more. The failure to secure a complete enumeration does not affect all crops equally; for example, in Maine the survey records for the five towns exceeded the Census totals of potato acreage by five per cent and the totals of hay acreage by 46 per cent.

Just what part of the increases in potato acreage previously mentioned can be regarded as fact and what part are due to 1929 Census incompleteness is still problematical. In connection with revisions, a separation was made and at present the accepted incompleteness is as follows for these states: Maine, 2 per cent; New Hampshire, 11 per cent; Vermont, 5 per cent; Massachusetts, 13 per cent; Rhode Island, 7 per cent; and Connecticut, 29 per cent. The rather large differences between these percentages and the acreage changes indicated by the Census were more or less forced into a series of acreage increases for the intervening period. While no proof can be offered, it is my opinion that the potato acreage estimates in some of these states were unwarrantably forced inorder to avoid taking an apparently extreme estimate of Census incompleteness.

It is not my desire to convert this discussionto the subject of Census adequacy but merely to point out the importance of the two essentials for satisfactory county estimates: (1) substantial and representative sample data for determining year to year changes; (2) adequate and comparable Census data for base periods.

The problemof estimating county yields of potatoes is less difficult than acreage. This is, of course, due to the fact that errors due to inadequate samples are not carried forward from year to year. Referring again to the original county estimates prepared for the Warren Act established prior to the release of Census data, we find that for 1934 fourteen of the sixty-seven county estimates are within five per cent more or less of the yield per acre found by the Census and that for fourteen additional counties yield estimates are within six to ten per cent more or less of the Census yields. In other words, it appears that for about 42 per cent of the counties, samples of yields furnished a fairly accurate basis for estimates in 1934. As in acreage, the failure of county estimates of yields to approach Census yields is due in part to similar failure of the state average yields.

The difficulties of reaching satisfactory county estimates of yield per acre appear clearer when it is noted that in only 13 counties do the 1934 Census yields fall withinthe range of three available yield indications, including both yields available from acreage and production data and yields reported for the locality. This leaves the problemof determining the extent to which reported county yields should be read down to secure yields comparable to the Census basis.

Taking the mean of the two principal indications of yield, that is, data from samples of acreage and production and estimated yields reported for the locality, we find that both of these indications are substantially higher than the average yields secured by the Censuses of 1929 and 1934 in the majority of the counties. The average of these two indications in 1929 range from 38 per cent below the Census yield in Grand Isle County, Vermont, to 76 per cent above in Windham County, Connecticut. In 1934 the range is from 23 per cent below the Census yield in Sagadahoc County, Maine, to 73 per cent above in Hampden County, Massachusetts. The averaged indications for the majority of counties in both Census years show deviations 20 to 50 per cent above the Census average yields.

Deviations in the same county for the two Census years are not as a rule consistent with each other. In only fifteen of the sixty-seven counties do the deviations for the same county in both years fall within 10 per cent of each other. This indicates the difficulties of reaching representative county yield estimates for potatoes on the basis of the data now available for this purpose. Adequate and substantial sample data is needed to establish representative county yields. The results in Aroostook tend to establish this conclusion where the county average yield originally set up for 1934 was only 1 per cent above the Census whichbecame available later. In 1929, original county yields for Aroostook were only 3 per cent too low.

No attempt will be made to discuss the accuracy of county production of potatoes except to note that in the past acreage estimates have tended to be too low and yield per acre estimates too high so that in general the errors in the two components of production are offsetting.

This review of the basis of county estimates for the five year period 1929 to 1934 serves only to emphasize the two basic needs for satisfactory county estimates: (1) substantial and representative sample data for determining year to year changes in acreage and yield per acre; (2) adequate and comparable Census data for base periods. I believe the sample data have shown some improvement in recent years; however, insome counties where potato acreage is rather unimportant the standard size of sample furnishes little reliable information and even if built up to a material extent, would still remain inadequate because of the diverse nature of the universe under consideration. I have not mentioned county estimates since 1934 for the reason that we will have no criteria of their accuracy until the results of the 1939 Census become available. Personally, I am hopeful that if a reasonably complete Census enumeration is secured, these estimates willprove more satisfactory than estimates for the five year period 1929-1934.

COUNTY WHEAT ESTIMATES FOR THE A.A.A.

J. G. Diamond,
Montana

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Of all the problems that arose in connection with making county wheat estimates for the A.A.A., the problem of determining county harvested and seeded acreages was the most important. This problem was likewise the most difficult in states having no assessment data either annual or biennial upon which to base county estimates of acreage. It is concerning this problem in such states that the following discussion primarily relates.

County estimates under these conditions are made empirically. In other words the method is experimental rather than precise, and the method probably varied considerably among the various states.

Briefly stated, the available data consisted of: (a) U. S. census acreage harvested; (b) sample data from crop surveys relating to acreage harvested; and (c) crop survey data relating to abandonment of seeded acreage. Check data such as railroad shipments by counties did not enter directly into acreage estimates and were used principally to check production estimates, which adjustments in some cases ultimately resulted in acreage adjustments.

The set-up of preliminary district acreages was the first step in the problem. Starting with the census base, the crop survey data were used to set district figures to serve as starting points, and to be adjusted as the experimental process developed. The principal crop survey indications came from the September rural carrier survey, and consisted of: (a) the current to current (C/C) percentage of change in acreage for identical farms; and (b) the ratios and ratio-relatives of wheat acreage to all land in farms. The data were used both in raw form to determine district estimates and plotted on graph paper along with the census data fromwhich plottings the district acreages were read. In Montana we used cartesian charts in our first A.A.A. estimates in 1933, but found the semi-log graphs much more helpful when used in 1937 in our county estimates, for later years.

After the first rough district acreages were determined, estimating county acreages within the district became the next step. Here our survey data became so thin that they served no useful purpose in case of the less important counties or counties with few reports. The larger counties, or counties with sufficient reports were therefore analyzed first and preliminary figures set in. For the other counties the district average percentage of change in acreage was used to set up the figures, modified in some cases according to the statistician's judgment.

As a general rule, the year-to-year changes in wheat acreage in minor counties are less violent than in larger counties. This was one of the facts considered where the original district figure would not reasonably fit the district total of counties. In such cases the answer usually was found in some other district where the preliminary district figure disagreed with the county district total and the difference was in an opposite direction.

With the establishment of preliminary county estimates and some further adjustment of district acreages, the next step was to apply the crop survey yield per acre data to obtain the preliminary county production estimates. In this case the county production figures were determined first and such figures tested against such check data as railroad shipments plus seed requirements. A similar check was also made on a district basis.

From the preliminary production by counties and districts, both county acreage and/or district acreage adjustments were made according to whatever seemed to be the most reasonable interpretation. In cases where county yield figures were questionable, adjustments were first made in the yield per acre and the remaining needed adjustments then made in acreage. No further adjustments were then made until similar estimates for the series of years were completed. This done, the district acreage figures by years were plotted on charts for critical review. Similar charts were made for the more important counties and for the minor counties in 1933 we made a plotting between the census years to determine the reasonableness of the year-to-year estimates against a trend line drawn from one census dot to the next.

As a result of this step numerous minor adjustments became necessary to correct what appeared to be the rough spots of the curves. Adjustments between districts were made in a compensatory manner, as much as possible. Within the district, adjustments were made in a similar compensatory manner.

Since our first district figures were set up to closely approximate the state total, the compensatory nature of subsequent adjustments tended to hold the district and county totals rather close to the state totals. This held down the size of the arithmetical adjustment factor used to bring final acreage and production figures into line with the state totals. The arithmetic adjustments of acreage, and production, necessitated deriving the final county yield figures.

Prior to the A.A.A. county estimates, it was our practice in Montana to carry the process a step further to set up the production figures as exact products of acreage times yield and then make final adjustments in both acreage and yield to balance out to state totals. This adjustment polishes off, as it were, the final product, but requires considerable additional time and adds little to the value of the estimates.

Thus far we have dealt only with harvested acreage, harvested yield per acre and production. For planted acreage we had no census

base and the use of June acreage and March Intentions data as indicating planted wheat acreage was not satisfactory, although both these surveys were used for what they were worth.

Our approach to the establishment of seeded acreage was to determine a percentage of abandonment figure by counties. In this process, district data were first set up and then the county abandonment indications were mapped. The use of a map helped greatly in getting a proper spread of the abandonment percentages and a gradation from the areas of heavy to light abandonment. Since abandonment is largely a result of weather, except for such localized weather damage as hail and flood, an abandonment map should resemble a weather map.

By the application of the abandonment percentage to the harvested acreage by counties we set up county seeded acreage figures. These were added into district totals and the district totals arithmetically adjusted into the state total. The next step was to arithmetically adjust the county seeded acreages into the new district totals. The yield per seeded acreage was a totally derived figure based entirely on the percentage of abandonment taken.

The use of county estimates for major crops in the A.A.A. program raises the question of their preparation for general use. There is a definite demand for such estimates on part of everyone using state agricultural statistics, and even where made by the empirical methods herein described, they are accurate enough to serve a useful purpose.

COTTON COUNTY ESTIMATES FOR THE A.A.A.

V. C. Childs,
Texas

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It is hardly feasible in a ten minute paper to attempt a comprehensive discussion of methods of preparing county estimates for cotton. I would not attempt to tell these battle scarred veterans how to prepare county estimates, anyway. Each state and each year is a different problem involving the use of different arrays of data and different approaches.

In most respects the southern field offices are in much better position to prepare county estimates for cotton than for any other crop. That is not saying a great deal for the cotton county estimates, however, because basic data and office facilities are far from adequate for the preparation of dependable county estimates, even for cotton. In 1934 they were prepared, promulgated and vigorously defended, in spite of having no provision for such a program, because an urgent need had arisen and no other organization was in position to do even a rough job.

The emergency in the early years of acreage control was understood and sacrifices were made willingly to provide a working basis for the A.A.A. programs. In making these sacrifices to provide figures for a period of years in which basic data were sadly lacking, it was hoped that the future would bring adequate provisionfor this work, which is so vital to the adjustment programs. But, as the emergency became chronic, county estimates became a regular part of a greatly expanded program of regular work, with no provision for securing basic data in sufficient volume for such estimates, and furthermore, in the face of a reduction in personnel. This leads one to wonder if this tremendous job is not taken too much for granted by Washington officials and others who use the figures -- and if adequate provision will ever be made for county estimates as long as estimates of a sort are delivered without such provision.

While I think a remarkable job has been done in preparing the estimates to date, considering the limited facilities, only those who have taken an active part in the actual preparation of these estimates can appreciate how inadequate they are for the purpose for which they are used.

Having the Census report of quantities ginned by counties is, of course, a decided advantage in determining production by counties. A surprising and varying percentage of farmers, however, gin their cotton in other counties than the ones where it was produced. Some counties produce only about half of the cotton ginned in the county, while others produce several times as much as they gin. Some counties have no gins.

In most counties the addition or loss of a gin may make a complete change in the picture. This makes necessary some current indication of the correction to be applied to ginnings to arrive at production. For 1929 and 1934 the farm enumeration of the Bureau of the Census was used. The 1929 relationship between ginnings and the farm enumeration was used for the 1928 estimates also, and the 1934 relationship was used as a basis for the ginnings adjustment in 1935, 1936 and 1937. The Census relationship could not be followed absolutely in later years because 1934 was a very unusual season in many areas. Departures from the Census relationship were based partly upon studies of the number of active gins each year in surrounding counties and partly upon the need for more or less cotton to fit acreage and yield indications. The cross-county ginnings allowances for the years 1930-32 were based upon the results of a survey of ginners which was made cooperatively with the Bureau of the Census in 1933. The pressure brought to bear on some ginners because of their reports in this survey of cotton ginned from other counties in all probability has ruined that source of this information for a long time, unless it is secured from their records by competent, disinterested enumerators. At this time we are a long way from the 1934 base and more dependable indications of production must be provided if serious errors are to be avoided. Large, representative samples of acreage and production data, larger than can be secured from voluntary reporters by mail, are badly needed as supplemental indications of production while and by supplying dependable indications of acreage and yield per acre.

County estimates of cotton acreage and yield per acre have been made on somewhat of a "catch-as-catch-can" basis. By this, I mean that we have been forced to use anything we could find for indications. A different approach and a different type of data have been used for almost every year. Some have been good and others have been extremely unsatisfactory. For 1929 and 1934, of course, the Census enumerations were available. For 1932 and 1933, the reported yields on the following years contracts were probably the most useful indications. In 1935 it was the measured acres of signers and non-signers. For 1928, 1930 and 1931, the main dependence was the regular sample from crop reporters, and in 1936 and 1937 it was the sample from special A.A.A. lists. We have not had the combination of dependable acreage and yield data in any year (Census years excepted) which would throw any light upon production. In five of the ten years our main dependence has been a very inadequate sample of voluntary acreage and production reports. This means that a lot of "estimates" have been plucked from the ether.

One point I wish to emphasize is that we have had no data which were designed for the purpose for which they were used. We have been forced to use scraps of information from many sources, which became available by chance. The job is too important and there is too much at stake to permit the estimates to continue indefinitely on such a haphazard basis. For this addition to our regular program, as stated before, there is urgent need for larger samples of acreage and production data than we have ever been able to secure by mail. This need will be particularly urgent if the A.A.A. continues to call for the current year's estimates by the end of the year.

Possibly the Sample Census Enumeration will be our salvation. This will take time, however, and until such a plan is perfected and approved, our best approach should be to plan to secure and make effective use of A.A.A. data. To use A.A.A. material effectively, it is very desirable that representatives from our division have a voice in the preparation of worksheet and summary forms so that the needed information will be secured. Needed items which are usually omitted from the forms are "total land in farms" and acreage and production for the preceding year. Non-signers as well as signers should be included in the sample if it is to be useful. In fact, the total measured acres for all growers, to be made available to the Division by December 1, would not be asking any more than the A.A.A. has demanded of us. This, or any continuous program of helpful data, will call for constant and aggressive action on the part of our Washington office.

USE OF A. A. A. DATA AS BASIS FOR COUNTY ESTIMATES OF CROP ACREAGES

Robert E. Straszheim
Asso. Agricultural Statistician

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AGRICULTURAL ADJUSTMENT ACT OF 1933

The first congressional action for the control of agricultural production was passed in May 1933 and known as the Agricultural Adjustment Act. Under this Act, the nation-wide Agricultural Adjustment programs for various basic commodities were administered by commodity sections within the Agricultural Adjustment Administration. Each commodity section gathered the statistical information necessary for its program. The nature of the data gathered varied quite widely between commodity sections.

DATA AVAILABLE FROM TOBACCO PROGRAM

Statistical information was gathered only with respect to tobacco for farms which were to be covered by tobacco contracts. No effort was made to ascertain whether or not the data reported by farmers for the purpose of signing tobacco contracts were in agreement with check data previously reported. There appear to be at least two serious inadequacies in the tobacco information. First, since data were gathered for only participating farms it becomes necessary to determine the degree of selectivity of farms participating in the program. Second, gathering only information with respect to tobacco did not make it necessary for the farmer to account for all farm land, which might have resulted in reported tobacco acreages somewhat different than they would have been if a complete accounting of farm land had been necessary.

Preparations were made in the fall of 1935 for the 1936 tobacco program which was later invalidated by the United States Supreme Court. In connectionwith this program, data were gathered for all tobacco farms and such data were listed. In this program, as in previous programs, no attempt was made to obtain a complete accounting of all farm land. Therefore, the problem still remains of determining whether or not the tobacco acreage reported is at the proper level.

Tobacco acreages obtained in connection with checking compliance have not been tabulated in Indiana. I was unable to learn anything about the accuracy of such data.

DATA AVAILABLE FROM WHEAT PROGRAMS

An application for a wheat allotment contract was obtained from each farmer who wished to sign a wheat contract for the years 1933, 1934 and 1935. The only data tabulated from application were the average seeded and harvested acreages of wheat. These listing sheets have been returned to the county offices but county totals are available in

the office of the Agricultural Statistician at Purdue. Average acreage data would be of little, if any, value when making yearly county estimates.

In the fall of 1935 an application was obtained for each farm which was to be covered by a wheat contract. These applications contained the seeded and harvested acreage of wheat for the years 1930 to 1935 and in certain specific instances the seeded and harvested acreage for the years 1928 and 1929. In addition to the long series of wheat data, the application also contained a table which gave the acreage of each crop grown on the farm. To my knowledge, this information was not gathered in Indiana except for farms which were not expected to be covered by a wheat contract.

The only data listed were the seeded and harvested acreages of wheat for the years 1928-1935, inclusive. The listing sheets for only a part of the counties had been sent to the state office at the time of the United States Supreme Court decision of January 6, 1936, after which no more listing sheets were sent. Later the Wheat Board was instructed to return the listing sheets to the county offices. As a result, only county totals for about 35 counties are available, which data are of very little value for making county estimates.

DATA AVAILABLE FROM RYE PROGRAM

It appears that crop acreages were obtained for the years 1934 and 1935 for the farms to be covered by Rye contracts, but provision was made for listing only the rye data. I am unable to learn how many of such data were actually listed and totals recorded in the state office.

DATA AVAILABLE FROM CORN-HOG PROGRAMS

In connection with the 1934 Corn-Hog program, an application was executed for each farmer who expected to sign a corn-hog contract. In addition, in all the important Corn Belt area, a work sheet was executed for each farm not covered by a Corn-Hog contract. Only a part of the above information was listed. From applications for contracts the farm acreage, corn acreage, total crop acreage and the acreage of the most important crop other than corn were listed. From the non-contract work sheets the farm acreage, corn acreage and total crop acreage data were listed. Totals of the above data are on file in the office of the Agricultural Statistician at Purdue.

The Corn-Hog data for the 1934 Corn-Hog contract have some of the same weaknesses as the tobacco, wheat and rye data, in that only a part of the acreage data for a farm were listed and in the non-important Corn Belt counties the non-contract work sheets were not executed.

In connection with the 1935 Corn-Hog program, a tabulation was made which showed the acreage of corn planted in 1935 by contract signers. However, very little use can be made of such data because of the selectivity of contract signers as compared with non-contract signers.

I realize that the foregoing does not show how data can be used in making county estimates, but rather I have attempted to show the nature of the data available.

SOIL CONSERVATION AND DOMESTIC ALLOTMENT ACT

In February 1936, the Soil Conservation and Domestic Allotment Act was passed for the administration of a different type of program. The Agricultural Adjustment Administration was then reorganized and 5 divisions were established, each division charged with the responsibility of administering the program in its particular region of the United States. I am most familiar with the statistics collected by the North Central Division, and will give detailed statements about the data, but would like to point out that there are vast differences between the volume of data available between regions and the nature and authenticity of such data.

DATA AVAILABLE UNDER THE 1936 AGRICULTURAL CONSERVATION PROGRAM

It will be necessary for me to confine my comments to the Indiana data but the same kind of data are available in all states in the North Central Region.

In the spring of 1936 a concerted effort was made to obtain a work sheet for each farm in the North Central Region. This work sheet contained data with respect to the 1935 harvested acreage of each of the following crops and land uses: all field corn, wheat, oats, barley, rye, soybeans and cowpeas, potatoes, vegetable crops other than potatoes, other soil depleting crops, alfalfa hay, clover and timothy hay, other tame hay, idle crop land, cultivated fallow, rotation pasture, other plow pasture, wild hay, native pasture and range land, orchards and vineyards, other non-crop land, and total farm land. These data were tabulated by townships and county totals are available in all state offices.

During the summer of 1936 a situation developed which necessitated an accurate establishment of the 1935 acreage on all participating farms, which was done by measurement at the time of measuring the 1936 acreage of crops. The 1935 measured acreages of course are subject to weakness that the committee had to depend largely upon the farmers' word as to the location of the 1935 crop.

The measured acreages of 1935 crops on participating farms were recorded in duplicate. One copy is on file in the state office. The following data were tabulated: 1935 and 1936 corn acreage, 1936 wheat and oats acreage, 1935 and 1936 acreage of all soil depleting crops as a group, 1936 acreage of alfalfa hay, 1936 acreage of clover and timothy hay, 1936 acreage of all soil conserving crops, total acreage of crop land, the 1936 acreage of tobacco, cotton, flax, and sugar beets, and the estimated 1935 acreage of all soil depleting crops as a group for the farms which were measured. This tabulation made it possible to compare the estimated and measured acreage of all soil depleting crops as a group.

In Table I below appear the estimated and measured acreages of all soil depleting crops as a group by crop reporting districts. The estimated acreage for the state as a whole was 2.2% greater than the measured acreage. The sample measured represents about 65% of all the soil depleting acreage in the state.

Table I

1935 Acreage of all Soil Depleting crops as a Group on Farms Which Were Measured in the Fall of 1936 in Indiana

Crop Reporting District	As Measured	As Estimated	Reported Bias Measured %
1	900,520	911,753	101.2
2	787,185	800,057	101.6
3	649,593	661,125	101.8
4	700,947	712,057	101.6
5	1,395,941	1,420,241	101.7
6	570,107	587,853	103.1
7	704,828	722,448	102.5
8	268,882	280,597	104.4
9	233,072	254,201	109.1
State	6,211,075	6,350,332	102.2

I have applied the bias factor of all soil depleting crops to the measured corn and wheat acreages and compared the results with the assessors corn and wheat acreages equalized to the 1935 United States Census farm land by townships. The corn data appear in the Table II below.

Table II

1935 Harvested Corn Acreage in Indiana

Crop Reporting District	1936 Agricultural Conservation Program Data: Farmers Estimated acreage	1936 Agricultural Conservation Program Data: Indicated Measured acreage	Assessors Acreage Reported	Assessors Acreage Adjusted by Townships to 1935 Census Farm Land
1	629,994	622,524	559,826	610,833
2	529,632	521,291	465,312	508,727
3	416,631	409,264	377,963	407,401
4	546,219	537,617	465,497	529,995
5	1,038,519	1,021,059	920,004	1,003,616
6	397,296	385,350	362,354	388,340
7	484,224	472,414	365,451	456,279
8	238,352	228,307	189,236	230,366
9	210,665	193,093	181,858	202,748
State	4,491,532	4,390,919	3,887,501	4,338,305

It is noted that Agricultural Adjustment Administration corn acreage for 1935 is about 1 per cent greater than the assessors' equalized acreage. The wheat data appear in Table III below.

Table III

1935 Harvested Wheat Acreage in Indiana

Crop Reporting District	1936 Agricultural Conservation Program Data: Farmers Estimated Acreage	1936 Agricultural Conservation Program Data: Indicated Measured Acreage	Assessors Acreage Reported	Assessors Acreage Adjusted by Townships to 1935 Census Farm Land
1	129,494	127,958	114,658	125,854
2	251,433	247,473	220,667	241,155
3	217,275	213,433	196,098	209,229
4	231,865	228,214	197,157	224,931
5	461,205	453,496	419,032	455,703
6	154,110	149,476	143,278	152,151
7	375,517	366,358	306,053	365,574
8	116,369	111,465	96,298	112,462
9	115,677	106,028	102,042	112,998
State	2,052,945	2,003,901	1,795,283	2,000,057

One may argue that the sample which was measured was highly selective. In Table IV appear the ratios of soil depleting crops to crop land on an estimated basis for the farms which were measured as well as similar ratios for all farms and in addition there will be found the measure of selectivity which is the ratio on measured farms expressed as a percentage of the ratio on all farms.

Table IV

Ratio of Soil Depleting Crop Acreages to Acreage of Crop Land - 1936 Agricultural Conservation Program

Crop Reporting District	All Farms in the County	All Farms Measured for 1936 Program	Degree of Selectivity of Measured Farms
1	.826	.865	104.7
2	.713	.740	103.8
3	.702	.715	101.8
4	.743	.783	105.4
5	.761	.767	100.8
6	.714	.725	101.5
7	.620	.659	106.3
8	.555	.608	109.5
9	.539	.574	106.5
State	.706	.746	105.6

In my opinion, the estimated data collected in the spring of 1936 after being corrected for bias between the estimated and measured acreages, furnish the best base line for making estimates we have ever had. The data are the most complete agricultural census we have ever had, and they were taken by men who knew agriculture.

The 1936 measured acreages obtained in connection with determining performance in the fall of 1936 are reliable data but are available only for farms which were measured which represent about 65% of the crop acreage. The only 1936 crop acreages tabulated are corn, wheat, oats, all soil depleting crops as a group, alfalfa hay, clover and timothy hay, all soil conserving crops as a group, tobacco, cotton, sugar beets, and flax. To use such data would necessitate making an allowance for non-participating farms.

In the fall of 1937 the county committees derived measured acreages for all farms participating in the 1937 program. These data are now being tabulated and in Indiana they estimate they will have the measured acreage for between 90 and 100 thousand farms, which represents a larger proportion of the crop land than is represented by the number of farms.

For the 1937 participating farms there is being tabulated the 1937 acreage of field corn, wheat for grain, oats for grain, barley for grain, rye for grain, soybeans and cowpeas for grain, potatoes, sugar beets, cotton, tobacco, total soil depleting crops or soil depleting land uses, and a number of other items. In addition to the above measured acreages the community Committeemen estimated the 1936 and 1937 acreages of corn, wheat, potatoes and tobacco for non-participating farms, to be used as a basis for the 1938 program. The 1936 and 1937 acreages of corn and wheat for both participating and non-participating are being tabulated on the 1938 program listing sheets. Such tabulation will make a second good base line for estimating corn and wheat acreage. It will be weak only to the extent of the number of non-participants for whom 1936 and 1937 acreages were estimated.

USE OF A.A.A. DATA AS BASIS FOR

COUNTY ESTIMATES OF CROP ACREAGES

(South Dakota)

E. V. Jones
South Dakota

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Since the Division of Crop and Livestock Estimates has been relieved of responsibility in connection with the administration of the A.A.A. programs, we in the state offices are less familiar with the details of the statistical data involved. This is especially true in South Dakota where the state office of the A.A.A. is located at Brookings and our own office at Sioux Falls. Our findings, therefore, reflect only that information obtainable through occasional contact with the State Committee.

Before accepting A. A. A. data, it is necessary to consider the nature of the data assembled, the conditions under which they are assembled, the purpose for which they are intended, and the likelihood of bias and error. Going on the premise that any source of data is valuable if its shortcomings are known, the following observations relative to A.A.A. data are listed as briefly as possible.

Coverage:

In the spring of 1936 an attempt was made to complete Work Sheets (NCR-1) for all farms in each county. This work sheet called for total land in farms, total crop land and the acreage of a few individual crops in 1935. The first questionof completeness of coverage appeared at this time. In South Dakota the estimated completeness of coverage ranged by counties from 100 per cent down to 50 per cent.

In the fall of 1936 the acreage of certain crops on participating farms (which were of course only a part of those covered by work sheets) were measured and fairly reliable data were obtained on that particular group. Thus the A.A.A. data, although often considered otherwise, is only a "sample". Viewing the wide variation between counties in the percentage participation and the wide variation in percentage of coverage of the work sheets, the question of selectivity appears.

Selectivity:

Due to the purpose for which A.A.A. data are assembled, they may be considered the antithesis of a random sample. This is clearly shown by the variation in participation between the various types of farming areas within the state. Percentage participation is greatest in those districts where the past performance gives

farmers a favorable soil depleting "base" and participation is lowest where past performance gives the group the least favorable "base". Where this variation is seen between counties and districts, there is no doubt that the same selectivity exists as between individual farms within a county.

Data from participating farms are probably low because of the required reduction in soil depleting crops and because there is a tendency for only those producers who can benefit themselves by making these reductions, to participate in the programs. Since detailed acreage information is only obtained from those who participate, we see no method, as yet, by which its influence can be overcome. The sample is, therefore, highly selective but until it is measured by comparison with data which are considered more reliable, the degree of selectivity is not known.

With no measurements and very little reported data obtained from the nonparticipating farms, about the only approach to county totals of individual crops is to attempt to estimate them, on the basis of ratios to crop land or farm land derived from participating farm data. Since our state estimates are established before county estimates, our usual procedure is to establish county acreage estimates in proper relation, county to county, and then scale them to the state figure. With much variation in the degree of selectivity between counties and districts, this practice of flat scaling would be hazardous.

Comparability:

We have seen A.A.A. data summarized one or more times each year since 1933. No two years have seen the same data gathered nor has it been tabulated or summarized in the same way. With little continuity in the data, the same approach to county estimates cannot be made each year. Experience with A.A.A. data for 1935, 1936 and 1937 will have some value but will not necessarily serve as a guide for the work in 1938.

The experience of states within the North Central Region can hardly be of much value to states outside the region, since the data assembled by the various divisions differ greatly. Also, the experience of states even within the North Central Region is not entirely comparable. It is true that all states within the region use the same work sheets, performance forms and listing sheets, but judging on the basis of information obtained from the Nebraska office, there is considerable difference between various crop classifications, dates of performance, etc. Due to such causes and to occasional "letting down of the bars" in respect to certainprogram requirements it is highly improbable that experience in South Dakota could be of much value to the more distant states of Michigan, Illinois and Ohio, which, we believe, do not have an annual state census.

Acreage Classification:

The lack of true classification of acreage devoted to the various crops presents a serious difficulty. In a program where no prior contract is signed there is little chance of obtaining true "planted" acreage of any crop. Some of the more common causes are: (1) land devoted to winter wheat that failed was often shifted to summer fallow in order to obtain benefit payment permitted for this practice; (2) land originally intended for spring crops, and in some cases actually seeded but failed early in the season, is diverted to summer fallow if it is early enough in the season to perform the first operation before the date limit; (3) erroneous classification due to estimating. In most cases where one large field is devoted to several soil depleting crops, an actual measurement of the entire field is made but the proportion devoted to each soil depleting crop is only estimated; (4) simple cases of wrong classification; such cases are not necessarily deliberate or to the advantage of the producer; except for controlled crops, the proper classification of crops within the soil depleting group is not considered of vital importance to the administration and this leads to some laxity. Probably the most serious problem in this respect is the variations in the degree of accuracy in classification as between counties. With a different administrative group in each county, there are inevitable differences in interpretations and degree of conscientiousness; (5) lack of clear differentiation between planted and harvested acreages of the same crop. According to the statement of the A.A.A. state statistician, one of the difficult problems is to obtain a correct listing of planted acreage for those crops for which "planted" is required and to obtain harvested figures for crops for which "harvested" is required. Our experience indicates that the data recorded are usually a mixture of both and in varying degrees between counties.

Conclusion:

In South Dakota, official estimates are compiled for 20 crops. Separate data on winter wheat, durum and other spring are not obtained by the A.A.A. Although recorded on NCR-114, separate data on a number of minor crops are not entered on the listing sheets. Thus data on only 6 or 7 crops out of the 20 are available for 1937.

An item of importance is timeliness. We find that A.A.A. data for 1937 will not be completely summarized until about June 1, 1938. Except for revision purposes, the data have little value. In fact, we find the A.A.A. requesting county estimates for certain crops in 1937 more than six months before their own data for 1937 are summarized.

A.A.A. data may of course be utilized to advantage as a check on other available data but only after a thorough study of its shortcomings. Except in some unusual circumstances and only with definite evidence of inadequacy in the State Census data would we in South Dakota be inclined to modify our county estimates to bring them

in line with A.A.A. data. Since we have an annual state census of agriculture, we are inclined to believe that if the time and effort necessary to bring A.A.A. data in shape to be used for county estimates were devoted to a more thorough analysis and study of our assessors' data, our estimates would be more accurate.

Much could be gained if the A.A.A. would obtain acreage data in such a manner as to make it a source of information for this Division. Aerial surveys now in progress might well result in the most complete and accurate data, but not without precision in acreage identification, both as between crops and as between "planted" and "harvested" acreages of each, other land utilization, etc.

A final consideration is whether or not A.A.A. data should be utilized in computing county estimates. Considering the fact that our estimates will probably be used in determining A.A.A. goals and program requirements in the future, much could be said in favor of keeping A.A.A. data, Crop Estimates data and Federal Census data entirely independent. A fusion of two or more of these now independent sources of data could easily introduce bias into the results of all.

USE OF A.A.A. DATA AS BASIS FOR COUNTY ESTIMATES OF CROP ACREAGES

S. T. Marsh
Tennessee

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Last year I was rather skeptical of the A.A.A. figures because in Tennessee very little measuring was done in 1936. The Committee-men, in many instances, made the maps from front porches rather than from field inspections. Several county agents told me that better figures would probably have been secured by putting the farmers on their honor and filling the worksheets in the county agent's office. In the spring of 1937, we secured the cotton acreage of signers for 1936 for the major counties as a percentage of their base. Practically every county apparently allowed their growers to get by with maximum payment. Measurements in 1936 were required in only Lake County and it is interesting to observe that this county shows a much larger per cent of cotton base planted than the counties where measurements were not made.

One limitation is the difficulty of securing and identifying true identical farms. The matching is tedious and subject to error even under the most favorable circumstances.

Greene County, which is one of our largest wheat counties, is a good example of some of these difficulties. It required a clerk a day and a half to identify and tabulate 322 identical wheat farmers. These identicals indicated the wheat acreage in 1937 to have been 95 per cent, but here was the weakness of the identicals. Wheat is grown in Tennessee on about one out of every 7 farms. To match true identicals it would have been necessary to have listed every 1937 application even though no wheat was grown, and match against 1936; otherwise our identicals were only the identicals of the "inners." To tabulate all 1937 applicants would require too much time. A tabulation of 1936 wheat growers to be matched with 1937 would also have been time-consuming and hardly practical, as many counties were not 50 per cent complete for 1937.

My interest was aroused to see how far identicals of the inners might mislead us, so we tabulated the remainder of the wheat farmers in Greene County. This tabulation showed 6.17 acres per farm (all farms) and 9.26 acres per wheat farm in 1937, compared with 8.27 acres per farm (all farms) and 11.60 acres per wheat farm in 1936. These data indicate reductions of 25 and 20 per cent respectively, while the "inner" identicals indicated a reduction of only 5 per cent. A large part of this drop was probably because actual measurements were made in 1937, but the study shows the danger of following "inner" identicals.

We found it difficult to match identicals and thought a faster and better indication could be secured by adding the total wheat acreage, and securing the ratio of wheat per farm (all farms), and

computing the ratio-relatives with 1936. The indication from this approach was discouraging. Our final estimate for the group of counties was about 32 per cent more than was indicated by the ratio relative per farm. A large part of this apparent 32 per cent error was probably because the acreage was actually measured or inspected in 1937, and only rough estimates were made by the farmers for 1936. We believe the ratio-relative per farm (all farms) will give fairly dependable indications of changes in the county wheat acreage in the future, since actual measurements have been made and the farmers know the size of their fields.

Tobacco is grown in Tennessee on about 60,000 farms averaging less than two acres per farm for all types of tobacco and less than an acre and a half for Burley, which is our principal type. As the benefit payments were relatively large for reduction of tobacco acreage and penalties for overplanting rather heavy, actual measurements or intelligent estimates by committeemen have been made for those in the program. A survey of non-signers is now being made for the 1937 crop and it should be practically as dependable as the Federal Census. We were agreeably surprised to find that the indicated tobacco acreage contract acres divided by per cent of counties' total farm land covered by contract (multiplied by 100) for 1935 was only seven and a half per cent above the Census of 1934 and only about eleven and a half per cent above the official 1935 estimate. The charts suggest that probably fairly dependable county estimates can be made for most counties before securing the data from non-signers in a normal year. This approach, however, would be misleading for Burley in an unusual year such as 1937. The price of Burley averaged around 40 cents per pound in 1936 and evidently the non-cooperators increased their 1937 acreage more than the participants.

Cotton is grown in Tennessee in 59 counties in all six of the crop reporting districts; however, the 18 counties in Districts 1 and 2 in west Tennessee have about 83 per cent of the acreage. The A.A.A. data is of more help to us in estimating the minor counties, especially the counties growing less than 1,000 acres. A survey of non-signers for the crop of 1937 has been practically completed and the final figures should be of great help.

In states like Tennessee, where we do not have an assessor's census, I believe we can get a great deal of help from the A.A.A. At any rate, if we use our regular correspondents and methods for securing state yields and acreages, and carefully consider the A.A.A. data in allocating the acreages to the counties, we can at least have the satisfaction of knowing that our county estimates are the best ones available.

USE OF A. A. A. DATA AS BASIS OF COUNTY ESTIMATES OF CROP ACREAGES

C. E. Burkhead
Maryland

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MR. CHAIRMAN, AND GENTLEMEN:

There has been a gradual evolution in the importance of A.A.A. data for use in our work. They are becoming more useful from year to year. It is imperative that we consider these data a new field of information. Generally speaking, our use of the data has been mostly as a check against previously prepared estimates of county acreages, instead of in the initial preparation of county acreages, but as a basis for revisions they have been our best material.

At first overstatement was a problem but as the programs continued, improved methods of checking compliance greatly minimized this problem, since farmers knew their reported acreages were to be established by actual measurements. With the A.A.A. "measured" cropland acreages available, indicated total individual crop acreages "built up" to 100 per cent on the basis of cropland incompleteness are more reliable because the amount of overstatement in measured areas has been drastically reduced. Considering aerial maps as a check on "measured acres" of cropland the old uncertainty of overstatement should be greatly minimized.

Methods of Using the Data:

A.A.A. measured cotton acreages are helpful in revising our county estimates especially in areas where farmers shift from cotton to another crop or vice versa. The "measured" A.A.A. cotton acreage by counties was "built up" to 100 per cent on the basis of cropland per cent coverage on all applications. 1935-1936 and 1936-1937 identical samples of measured cotton acreage served as one basis of indicated yearly acreage change. These indicated identical yearly changes were applied to the estimates for the previous year to calculate indicated county acreages for the current year.

For wheat, measures of A.A.A. incompleteness and indicated 100 per cent acreages were calculated similar to those for cotton. The 1936 and 1937 Agricultural Adjustment Administration "measured" wheat acreages were "built up" to 100 per cent coverage based on per cent coverage of cropland on all applications and Census cropland of 1934. A ratio relative per wheat farm for 1937 participants was used as one indication of county harvested acreage for that year.

Results of the Use of the Acreage Data:

A.A.A. data are especially helpful in aligning our acreage estimates of cotton and wheat in minor counties where our own sample data are lacking or inadequate, and in major cotton and wheat counties where all A.A.A. worksheets cover a majority of the total acreages of these crops. Since all commodities have been included in one worksheet, total cropland under worksheets compared with the Federal Census of 1934 has served as an excellent measure of total individual crop acreages.

Incompleteness of A.A.A. Acreage Coverage:

Prior to about 1935 we had no adequate record of final compliance. During the period 1935-1937 more stress had been given to measurements, and final coverage of individual crops and cropland may be calculated with less uncertainty.

For the 1936 Agricultural Conservation Program from which we have measured wheat and cotton acreages and cropland, about 60 per cent of the state's cropland and about 50 per cent of the farm land was under participating worksheets. For this same year about 60 per cent of the state's estimated harvested cotton acreage and 60 per cent of the estimated harvested wheat acreage was included in final measurements.

Reliability of Acreage Data:

Taking all available data into consideration cropland on all applications (measured acres) is the best measure of incompleteness and indicated individual crop acreages. Per cent coverage is important in "building up" county acreages of individual crops. Farms reporting individual crops, we find, is not a reliable measure of incompleteness. The same is true of the total number of all applications. The reasons are that an "average farm" for A.A.A. purposes is much larger than the Census classification but cropland is classified as crops harvested, failure and idle land, the same as the Census classification of "cropland."

Identical acreage comparisons from A.A.A. lists give a fair indication of yearly acreage change. A new list each year is best because so many farms change from year to year in size and operator. County ratio relatives based on individual crop acreages per participating farm are good measures of acreage change in a majority of counties.

Factors that Tend to Diminish the Efficiency of the Data:

A.A.A. data must be regarded as a sample just as our own Division data, and subject to the same analyses. Their stability is diminished by changes in administrative policy from year to year. Other weaknesses may be listed as:

1. Measured acreage neither harvested nor planted in all cases.

2. Dates and methods of measurements vary too much.

3. Drought conditions upset the data.

4. Not enough data (so far) on non-participating farms.

5. Delay in availability of tabulated information.

6. Lack of yearly comparability of data.

FORECASTING INCOME AND PRICES

Miner M. Justin,
Statistician, Indiana

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The first question arising from such a title is "Why forecast income?" Except as a step towards socialistic planning, the forecasting of income for farmers would not seem to have any obviously useful place among governmental activities.

The definition of the income to be forecast is another matter of interest. Should it be gross cash income, meaning dollars handled by all individuals in the industry? Or should it be the net cash income for personal use, meaning the difference between the money received and money spent for production costs? Should the income be the sum of the accounts of each individual in the industry, or should the industry be considered as a unit, and exchanges between enterprises within the industry be omitted? The way in which feeder stock, grain and hay sales, and other interfarm items must be handled depends on the definition of income. Likewise the way in which certain expense items such as hauling milk, commission charges, and inspection fees are to be considered may depend on the definition of income. There are those who feel that farm incomes should include allowances for farm products consumed on farms.

It is rather evident that one income forecast will not be equally useful to all people.

Regardless of the items to be included or excluded, income will be the product of quantities times price. In forecasting income some sort of forecast must be made of quantities to be sold or consumed.

For short periods of a month or so, the forecast of sales may be made by assuming the same sort of pattern as shown by past records. However, only a few farm products can be checked closely for total volume of marketing. And for a single month the seasonal marketing of a commodity may depart widely from average if the fluctuation in the measurable portion is assumed to be indicative of the total. If forecasts are not made by single commodities but by large groups, there is the implicit hope that the variations from average will be compensating. And the absolute level is perhaps indeterminable as closely as the variations from average.

For periods extending beyond a harvest date, the quantities would be subject to weather effects, but the likelihood of seasonal distortion would be lessened.

The forecasting of prices is beset by many of the difficulties of production forecasting since price is commonly supposed to be affected by the volume of the commodity. In addition, prices are affected by the business situation, or the production in various other industries. The interaction of supply and demand now is subject to other factors than those prevailing when the background was established. Adjustment programs the world over have been set up to modify the relation of price to supply as well as supply to other conditions. Furthermore, many of these programs are changeable by edict. The changes may arise from motives without economic reasons. Price forecasting under such circumstances would seem extremely hazardous if projected much distance into the future.

Short-time forecasting may be less uncertain. Speculators have long been practitioners of the art. However, publication of methods by successful speculators, if there are such, has been very limited. It has been said that forecasting by traders is largely done by the "feel" of the market, but few of our statistical offices are well located for forecasting by contact.

It would seem to me that even estimating income for past periods would be rather uncertain where the quantities involved are not susceptible to close measurement. When marketing figures are inadequate there would seem to be a tendency to use a conventional constant quantity and then the income estimates become simply another form of price index.

THE FARM INCOME ESTIMATE AND THE STATE STATISTICIAN

J. G. Diamond,
Statistician, Montana

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The relationship of the state statistician to the farm income estimate is quite different from that in case of estimates of production and prices. With the income estimates, his job is to supply most of the parts that go to make up the final product, without participating in the final assembly of the data. In the case of production and price estimates, his contribution follows through all of the various steps and ends with a recommendation concerning the final result.

As a result of this relationship to farm income estimates, the state statistician tends to see the problem as composed of many parts. If I may borrow an illustration from industry and compare the state statistician's job with that of a worker on the assembly line, it would follow that the state statistician could tell you what was wrong with the carburetor, springs, wheels, and windshield of the final product, but would not be thinking in terms of the problem of the automobile itself, nor be able to judge the end-product in terms of the original plan.

The field statistician's contribution to farm income estimates may be divided into three parts: (1) estimates of farm production; (2) estimates of prices received and paid by farmers; and (3) disposition and marketing data relating to farm production.

For purposes of making income estimates, each group of data is equally important and without the third group the final result could not be determined. While the first two groups of data have long been essential work in state offices, the third group has been a development of comparatively recent growth and has had to compete for its place in our program.

Most field offices probably realize the need of more adequate data if this third group of basic income material is to be found as adequate and reliable as are the first two groups.

In determining the disposition of crops, one thing that is badly needed is a quantitative census basis for such estimates. However, with the census schedule already filled to a point where the farmer's patience is taxed to the limit, it is difficult to see how additional questions on disposition can be added.

It is the minor crops generally grown, but primarily for consumption on the farm where produced, that present the real problem as to quantities sold. Most of such sales are from farm to farm, for seed

or feed, and vary greatly from year to year. The use of a commercial buyer list, such as a mill and elevator list, does not give an adequate picture of local sales. In case of hay in Montana, where considerable quantities change hands between farmers or ranchers, the use of the same list as that used for wheat and other grains is unsatisfactory. Our policy of eliminating producers from these inquiries might well be modified in states where the farmer himself is the most important buyer.

One of the surveys that is particularly weak is that of the Monthly Marketings of Grain and Hay by Farmers. In Montana this survey could probably be improved by adding farmers and stockmen themselves to the reporting list. However, here we encounter the objection that our regular reporting lists are already carrying a maximum load of inquiries. As in the case of livestock, where we have escaped some of these difficulties by building up marketing and railroad shipment data, so in case of crops we need to develop additional commercial statistics regarding disposition and marketing.

Special crops grown in restricted areas, even when of minor importance, usually present less difficulty in regard to sales than some of the more generally grown crops. Many such crops pass for the most part through commercial agencies from which both production and marketing data can be secured by field travel and personal contact. In most of such instances special surveys of producers merely supplement the data from commercial sources.

The problems of the parts added together become the problems of the whole. As assembly line workers, we know that faulty carburetors, weak springs, poorly fitted wheels, and a cracked windshield are not going to make the best kind of an automobile. Some of these defects can, of course, be remedied on the end of the assembly line in Washington, but most field men would probably agree that if they had a chance to look over the car just before it ran off the end of the line, they could make some last-minute adjustments and improvements. In case of crop income, if the statistician is to have no direct responsibility in the final process of assembling these estimates, it becomes almost the equivalent of what would happen if the Crop Reporting Board were to make final estimates of production without the December recommendations of the state statisticians.

In making this comment, I am not forgetting the fact that our office and, as far as I know, all field offices now carry about all the load that personnel and facilities will stand. But, on the other hand, there is the alternative that if we take on more load in case of the income estimates, we may find some other place where the load can be lightened and a more even emphasis placed upon the three groups of data relating to production, prices, and disposition of crops and livestock.

In summarizing this discussion of the contribution of the state offices in the matter of farm income estimates, the principal conclusions might be stated as follows:

(1) More adequate data from the census or other enumeration are needed for disposition and utilization estimates.

(2) A better coordination is needed of the data now collected as to time of survey and type of list.

(3) State recommendations on farm income by the statisticians would be desirable, or at least a state approval of the figures prepared at Washington prior to release.

(4) Adjustments in the whole schedule of crop estimates work in field offices might be made to permit more time and more emphasis to be given the preparation of income estimates.

FARM INCOME

D. L. Floyd
Statistician, Georgia

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During the past year I have hesitated in re-issuing monthly cash receipt releases of the Bureau because I was in doubt as to what totals would be shown at the end of the season and wished to avoid any discrepancies that might appear if anyone interested should make a total of the monthly releases and compare it with the final figure for the year. In this connection, I have been informed that peanuts, a very important cash crop with us and several other states, are not included in the monthly figures. If this be correct, a very considerable difference would be caused by this crop in a comparison of the figures just mentioned.

Friendly criticism was directed at us last fall because of the Bureau's estimates on cash income. The Associated Press had asked the agricultural workers located at the Georgia State College for an article discussing whether or not there was a business slump on the farm. Prices of cotton had fallen and farmers were complaining of being hard pressed financially. At that time the Bureau had just shown cash income for Georgia from January to October, inclusive, as $114,822,000 compared with $111,692,000 for the same period a year before. On the face of the situation it appeared that there was no slump in farm business and the papers were carrying prosperity stories released from Washington, based on the Bureau figures. After considerable discussion, the College and Extension people furnished the Associated Press an article from which I am quoting several paragraphs.

"Is There a Slump on the Farm?"

"If a business slump is measured from the standpoint of declining production and increasing unemployment, then there has been up to date no noticeable indication of a business slump on farms in Georgia. The larger production of most crops has caused an abnormal demand for labor for harvesting.

"If, however, a business slump on the farm can be measured by a slowing down in purchases by farmers and a feeling of pessimism toward the future, then current reports indicate such a slump. Purchases of new equipment, including workstock, are currently reported to be less than one year ago. Clearing of new land and erection of new farm buildings are reported to be considerably less than one year ago. Reports also indicate a rapid decline in the abnormal demand for farm labor for harvesting that has existed in the fall months.

"Further indications of a business slump on the farm are substantiated by the following facts:

"(a) Cash farm income including Government benefit payments from January 1937 through October 1937, in Georgia, is estimated by the Bureau of Agricultural Economics of the U. S. Department of Agriculture at $114,822,000. The income for the same period last year in this state was $111,692,000. This in itself is not an indication of a business slump, but the following additional facts should be used in connection with this income.

"(b) Georgia farmers purchased in 1937 871,813 tons of commercial fertilizer which cost approximately $21,795,000. The 1936 purchases were 665,399 tons at a cost of approximately $14,638,000. In other words, Georgia farmers used approximately $7,150,000 more commercial fertilizer than in 1936. On cotton alone, the increased cost for commercial fertilizer was approximately $2,892,000. In other words, the increased cost of commercial fertilizer in Georgia in 1937 has more than offset the indicated increase in income that has taken place from January through October.

"(c) Farm labor has cost more in 1937 than it did in 1936. Estimates of the Bureau of Agricultural Economics indicate that farm wage rates in Georgia for 1937 were approximately $2.00 per month greater than in 1936. These estimates also indicate that the cost for picking 100 pounds of seed cotton in Georgia in 1937 was 60¢. In 1936 this was 55¢."

The point I am trying to make is that although the 1937 figures to that date did show a favorable comparison in cash income total, and doubtless rightly so, it failed to present a true picture because some of the underlying factors were not brought out at the same time. As a state man who is constantly besieged with requests for farm income estimates, I am in favor of reliable income estimates being made. However, it is my opinion that these estimates should be as comprehensive as possible and all efforts should be directed toward preventing the public from arriving at erroneous conclusions such as the one just cited.

FARM INCOME AND PRICE FORECASTING

E. C. Paxton,
Statistician, Arizona

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Information received before this conference was not definite as to exactly what the address might cover. The substitution of farm income estimates for crop and livestock valuation estimates, formerly issued by the Bureau at the close of each calendar year, leads me to question three matters in that connection: (1) the reaction of the public to this change in policy; (2) the need for caution on the part of the state statistician in preparing basic data on which Cash Income may be computed; and (3) the danger that lurks in "Price Forecasting."

When our Cash Farm Income estimates for Arizona were issued for the first time last December, caution was exercised to see that full and concise comments were made to explain exactly what those income estimates involved, their significance and limitations, and how they differed from valuation of annual production. Nevertheless, most of the newspapers publishing those estimates, in whole or in part, either misused them or misinterpreted them or so emasculated them as to distort their true significance and lead the reader into some very false conclusions as to what they meant. The only violent reaction against the income estimates came from producers. They expressed themselves freely to the effect that it was just one further step on the part of the Department of Agriculture to focus the attention of Industry on the amount the farmer had to spend, so that manufacturer and distributor could the more easily direct sales efforts into fruitful territory for exploiting the unwary. The reaction of manufacturing, distributing, service and sales interests was highly complimentary. The newspapers found the income figures made to their order as an argument to advertisers for selling space. On the whole, we question whether the former valuation estimates were any more misunderstood or misused than were the Cash Income estimates, issued for the first time in December. My thought is that it will take a long campaign of education to induce a proper understanding of the significance and limitations of the Income series. The arguments will need to be most persuasive to the producers themselves.

Speaking solely for myself, I have already found myself establishing production and price series in my state without proper knowledge as to the purpose to which such estimates were to be put. It makes a vast difference whether a price series, once established, is to be used as an index of trend or is to be used in computing cash farm income. I have felt the need of more definite instructions from the administrative office as to how estimates established in the state office are to be utilized, once they are accepted by the Crop Reporting Board. Even when price series have been established on a monthly average basis, and may be very accurate as reflecting prevailing prices during the months in

question, such prices applied to any given portion of production may be entirely misleading. Those who use basic price, disposal, and production data should be well informed as to lags that may take place between earned income and accrued income to producers. Frequently production actually disposed of in October of one year may not become accrued cash income to the producer until August of the following year. Unless there is assurance that allowance is made for such lag, any attempt at monthly cash income estimates is abortive.

Doctor Stone, in his address on "Income Parity for Persons on Farms," delivered in June 1937, called attention to the deductions that must be made from gross returns in the algebraic summation of the items constituting national income from agriculture. In that summation it appears to me that we need a definite and universally understood set of criteria to guide us in just what "goods and services" fall into the category of "purchased or hired for the production of the year." There is considerable difference of opinion as to what purchases fall into this category, as those of us who have been close to the grass roots seeking price data very well know. I consider it of vital importance that the field statistician be fully informed as to all the limitations of content and utility that are to be placed around the data he collects and summarizes before he ever approaches his original sources of information. It will save a lot of false motions and conserve both his energy and his patience. I feel there is a lack of frankness in the Washington office about the purpose for which certain data, ordered from the field, are to be collected and proposed to the Board.

On the matter of "price forecasting," I believe I can sum up my personal view by simply saying that in case any economist or statistical analyst has the instincts of the prize fighter who likes to lead with his jaw, he will find nothing so provocative of results that will satisfy his greed for punishment as price forecasting. The better he forecasts, the harder will he hit the mat, and the greater his chances of being counted out.

FARM INCOME COMMENTS

E. L. Gasteiger,
Statistician, Pennsylvania

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Just before leaving Harrisburg, I received a letter from a boy in one of our vocational agricultural schools who had been assigned the task of writing a paper on draft horses. Among other things, he wanted to know which state led in the number raised. I don't know what the lad's previous experience was, but he closed his appeal for information with this plea: "Now, Mister, please don't send me a book, just give me the answer."

I'm not going to hand you a book on farm income. Dr. Stine and others have thoroughly discussed the subject. All I can do is to add a bit of local color.

Back in our country, farm income has been a goodly draft horse for a number of years, fairly well broken for service. If it appeared a bit wild last December and at places did not behave just as we expected, I'm sure the Washington staff of the Bureau will thoroughly tame the animal in due season. We field men shall continue to provide some of the oats to feed it and be constantly on the lookout for weak spots in the harness, but we sincerely hope that Mr. Callander will not send us a book of instructions, requiring us to master the art of training the horse.

Pennsylvania has had county estimates of crop production and value for a quarter of a century, and we began making county estimates of farm cash income in 1929. We know they are no good. Every statistician will tell you they are not worth a whoop, yet, curiously, they are very satisfying and, measured by demand for them by both the Government and the public, they are the most important data in the entire field of agricultural statistics.

We feel that dispensing with farm values on the December crop report in favor of cash income has been a grievous mistake. A valuable series back to 1866 has been broken. The corn crop of our state is worth $40,000,000 but the cash income derived from it only $4,000,000. Our pride has been greatly wounded.

What this country needs is a bigger and better farm income, and we are going to have bigger and better estimates of it -- estimates of greatly increased reliability, made currently and released promptly; then Congress should pass a law prohibiting revisions.

MARKETING STATISTICS IN THE BUREAU OF AGRICULTURAL ECONOMICS

S. R. Newell,
Marketing Statistics Section, Washington, D. C.

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There has been more or less confusion in the minds of some as to the basic reasons for the establishment of a Marketing Statistics Section in the Bureau. This bit of reorganization of the statistical work of the Bureau is the natural result of growth over a number of years. In the entire consideration by the committee established to study the statistical services, there was but one underlying thought: to improve the service.

The clearest explanation may be presented by first considering the organization of the two large statistics-gathering organizations, the Division of Crop and Livestock Estimates and the six market news services. The principal job of the Division of Crop and Livestock Estimates is estimating the volume of farm production. The principal job of the market news service is to report the market for farm products. Between the farm and the market there is a large field of activity involving transportation, storage, processing and manufacturing. It was in this field that we had more or less confusion. In other words, we had established facilities for collecting statistics at each end of the line but had left the middle unorganized. This new marketing statistics section now fills that gap.

When I say this in-between ground was unorganized, I do not mean that it had been neglected. We actually had a transportation section that collected most of the rail movement statistics and we had a cold storage section dealing with the cold storage holdings of a large number of commodities. These two were separate service units for the Bureau as a whole and from an operation standpoint there was little or no conflict or duplication of effort. In a good many other cases, however, the collection of statistics of trade output, manufacture and stocks was scattered among two or more units. This naturally led to a certain amount of duplication of effort, some overlapping of schedules and consequently complaint from the trade because they were burdened with more inquiries than they thought necessary. The duplication was not of itself a serious matter. In most cases this could be adjusted. The more fundamental problem was that of most efficient use of facilities, developing new technique and keeping the services abreast of the changes taking place in the methods of marketing, transportation, and so on.

It is furthermore evident that a marked similarity existed in the fundamental methods involved in the collection of these data. For example, the technique involved in making a cold storage report is similar to that involved in estimating dairy manufactures and cannery

production. The sampling problems involved in making a hatchery report are the same as those problems involved in many other types of estimates made from sample data. It was obviously uneconomic to set up a research unit for each of these scattered activities but research is fundamental to progress.

The main motive, therefore, for bringing together these various parts is to consolidate like lines of work in one place where more centralized analytical work can be done in solving many of the difficulties which confront a scattered group of workers in a common field. The purpose is definitely to build up and improve some excellent ideas that took form a number of years ago in the establishment of some of our most valuable series of economic data.

Now, there are difficulties to be encountered in this new organization. So long as we had our two main data-gathering units in the Bureau so widely separated as Crop Estimates and the news services, there was not often a conflict between the two fields. This is not so true now with our new market statistics unit. Standing as it does in between, there is a shadow, a penumbra, at each end in which there may be some dispute as to where the boundary lies. This unit must work in close cooperation on the one hand with the crop estimating activities and on the other with the news services. There will be rough spots to iron out, but on the whole I think it is going to do all of us a lot of good. In the first place, it is going to force us to forget about our minor differences over divisional lines and realize we are a Bureau.

So much for the basic reasons for the establishment of this Market Statistics Section. I want to go on one step further and indicate some of the things I believe are necessary to develop this field. I made the statement that research is basic to progress but I want to indicate the kind of analysis I have in mind.

There are analysts who are proficient in taking a series of data apart and finding out all the things that are the matter with it, but, like the small boy who found out what made the watch tick, they can't get it back together so it will "tick" at all, to say nothing of making it "tick" any better.

We have some statistical watches around the Bureau which I think may need fixing but we certainly should not use "small boy methods" in analyzing the difficulties. I have found out in going into some of these problems that the watch was a pretty good machine after all, and only needed a little oil here and there or a new part or two to make it run pretty well. I have found this out just often enough to make me a little careful in marking the pieces as I take a thing apart so I can get a workable machine back together again after it is all laid out on the work bench. I think a good many may be surprised, when they get to digging into some of the things that look funny on the surface, that there is, way down deep, a very good reason why certain of these things were done as they were. It may be long past time to change the way of doing it, but even so, don't condemn the hand-crank just because you have a starter now.

I want to take this opportunity to indicate a few inquiries which might be made into the marketing statistics work which I think would prove profitable. I am not trying to lay out a research program for you. I want only to indicate some of the questions that have arisen from time to time during the past couple of years which may be indicative of the place to start the analysis.

In the case of the cold storage reports I have wondered several times how complete the coverage of cold storage plants might be. I understand it is practically a full enumeration but we need to know more exactly how complete our coverage is. Another problem with these reports is the differences that arise between our Washington monthly reports and the current reports of cold storage holdings made through the market news offices, particularly the Dairy and Poultry Products offices. Here is one of those places where the line of division is not so distinct. The market news service collects some cold storage holdings daily and publishes the information. It is market news currently but becomes more of a marketing statistics function over the longer time. There may be very good reasons for differences but I have had it brought to my attention in the field offices and we should endeavor to arrive at some definite understanding.

There is a need for putting the records of several of the series in shape so that some studies can be made of them. This is true of some of the cold storage data and the records of dairy manufacture and hatchery production. After this is done there should be some very searching sample analysis. This is a sizable order. The first part of it might require 4 or 5 months time of one clerk with pretty good direction from a technical man. The last part is even a larger order but it will be the basis upon which improved service will be built. I'll be specific in one case as an example. I have noticed for some time the prevalence of the use of identical comparisons for a number of reports. In the case of the hatchery report I am told this identical comparison is a mixture of current to current, and current to historic comparisons. Aside from the fact that use to which identical comparisons can be put has very definite limitations, I am wondering what results when comparison on two bases are combined in this manner.

Now that I have opened up the subject of indications, I would like to point out a line of research which I consider fundamental. In the preparation of these marketing statistics there have been a number of indications used to estimate the change from one period to another or the amount of certain commodities manufactured or processed, etc. A considerable amount of research is needed to determine the value of these various indications. If we have some that are poor, let's weed them out now and reduce the amount of work required to get a reliable estimate.

I want to stick to my subject, but this seems to me to be so close to Crop Estimates problems, I can't help but remark that I have a feeling that research of this sort would be one of the most productive lines for this division to undertake. I know some has been done, but I feel a lot more is needed. I wonder how many indications we are requiring

our statisticians to work out that are either entirely useless or are so highly correlated with other indications that the increased precision obtained by their use is so small that we are literally wasting time and effort in computing them. I can only raise the question; I know of no one who can answer it fully.

There is one more topic to which I wish to call attention. This is not a new problem in Crop Estimates and is pretty much a thing for internal discussion and treatment. It involves the principle of decentralization and because it has been raised frequently in connection with the marketing statistics work, I feel it may not be out of place for me to mention it here.

Decentralization involves a very fundamental theory of economic utilization of resources. If we start with the assumption that state offices are needed to carry on the work of reporting certain crops and we assume that there is one job to be done, we must charge all of the cost of the field office to the one job. Now if that job requires only part of the state office time and another job is to be done, it will likely be economy to assign the new job to the field offices and thus reduce unit costs. If we assume that the two jobs are all that can be handled by the existing office forces, then any further additions must be accompanied by increase in facilities. At this point we are forced to consider a number of factors. We must determine whether or not the third job is one that should be placed upon the field office. Is it the type of thing that can be done there better than at some other place, or do we have some other organization that could take on the new work with less addition to total cost than would be involved in building up the field organization? Perhaps it is one of those things which would require only part time of a new technical man or a clerk. If we contemplate adding this work to, say, five offices we would have to hire five men if we decentralized. On the other hand, it may be possible to hire two men and centralize the work at one point and do just about as good a job. If this is the case, then the answer is quite plain: it should not be decentralized. Now, we may decide that this third undertaking is one that can be done so much better in the field than at a single point, it should be decentralized. Before adding to the field force to handle this work, perhaps it would be well to consider the first two jobs again and see if one of these is not the one to reverse our previous policy on and centralize that work while decentralizing the new work.

What I am getting at is this: that at the same time we are studying the statistical aspects of this new work we are taking on, there should be some very careful study made of operating problems. A good bit of this new work has been highly centralized ever since its beginning. There may be a good reason for this, and before we decide upon a decentralization plan we should study carefully the fundamental characteristics of the work to be handled. We should study the facilities for doing the job in this field. We should certainly make some very careful comparisons of probable cost of doing the job by several different methods. We should balance this against the probable gains to be had in the way of more accurate statistics and better service.

Do not misunderstand me. I think the program of decentralization that has been followed has undoubtedly been very constructive in a number of ways. I believe some of this new work we are assigned can be decentralized and better statistics will result. But I wonder if this is not a pretty good time to take stock to see where we stand on the whole program of this division.

There are a number of other topics I could touch on, but these few, with the specific ones that will come up in the group discussions, are enough to keep busy on for a while. I am glad to note that work has already been started on some of these and while we cannot expect to bring about great changes in a short time, I feel confident that with the assistance of this group working closely with the market news men, we are going to see some very fine progress during the coming year.

MARKETING STATISTICS IN THE DIVISION

H. C. R. Stewart,
Marketing Statistics Section,
Washington, D. C.

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With the increasing inadequacy of carlot shipment information, due to an expansion in the use of auto trucks during the past 10 years, new methods, indications and reports must be developed by the Transportation Section if adequate checks of production estimates are to be maintained. A record of the movement of food products by auto trucks, especially for most of the fruits and vegetables, would be very desirable at this time. Present facilities cannot be stretched to include this new work, since the cost of securing auto truck shipment data would approximate from one hundred thousand to one million dollars for fruits and vegetables alone. It must be recognized, however, that until "auto truck shipment" data are made available, many necessary fundamental determinations relating to the production and marketing phases of agricultural statistics will remain unanswered.

THE TRANSPORTATION SECTION

The Transportation Section was at one time a Division in its own right. During the World War period it necessarily expanded to huge proportions as the need became acute for the control of traffic in food stuffs, especially in fruits, vegetables, grains, livestock and dairy products. After the War the withdrawal of funds and other facilities made it necessary that the Transportation Section confine its activities mainly to furnishing shipment and unload information on fruits and vegetables, and, since this was its major activity, it was attached to the Division of Fruits and Vegetables of the Bureau of Agricultural Economics. The Transportation Section has cooperated with our Division in every possible way since its transfer. Most of us have realized that the statistics of rail movement and unloads have been as thorough and complete as was possible with the limited facilities. The Transportation Section works very closely with the Fruit and Vegetable Market News offices. The daily unload reports are checked by wire, and the Transportation Section provides a tabulation service and a constant re-check and final summary of many important fruit and vegetable items. This Section also secures carlot receipts of livestock at certain important points; also the advance report of livestock expected to arrive in Chicago, Omaha, St. Paul, St. Joseph, Kansas City and St. Louis.

In some of the smaller markets that are not contacted direct by the Transportation Section the information is obtained by representatives of the Livestock, Meats, and Wool Section, and an interchange of the information is made through the Market News Service. The weekly peanut shipment reports are handled by the Transportation Section from railroad freight agents and boat lines reports covering peanuts and

peanut oil from all the cleaning, crushing and shelling plants. The Transportation Section has an important job by contacting the freight agents and the railroad superintendents so that all reports will be submitted promptly. Dairy and poultry receipts in several of the larger markets are reported by freight agents direct to Market News men of the Dairy and Poultry Division. The commodities reported are cheese, butter, live and dressed poultry, and eggs, and the Transportation Section again makes the necessary arrangements with the freight agents for these reports, and frequently checks and makes personal contact with the railroads when interruptions or discrepancies occur. In addition to other dairy receipt information, reports of milk, cream and condensed milk are secured daily from Boston, New York City and Philadelphia. The Transportation Section has for many years obtained freight rates for the various divisions of the Bureau and during the past few years for the Agricultural Adjustment Administration. For example, contacts are made to provide monthly reports of broomcorn shipments for the Hay, Feed and Seed Division. They also make special arrangements for shipment or unload reports of commodities which are not regularly reported in connection with AAA or other programs.

By utilizing some of the special "pool" services in the Division it has been possible for the Transportation Section to release shipment reports at a much earlier date than previously. Shipment information, by counties and shipping points, has ordinarily not been available until two years have passed. For example, the 1935 shipment data were available late in 1937. This year this work has been speeded up by securing the cooperation of the Market News offices and the railroad freight agents. This week we are releasing county and shipping-point information for fruits and vegetables for the states of Idaho and Arkansas for the calendar year 1937. Similar releases for other states will be issued as soon as discrepancies are cleared up and the stencils can be prepared. It is estimated that this work will be completed from 4 to 6 months earlier than ever before.

THE COLD STORAGE REPORT SECTION

In the few months that this Section has been assigned to this Division it has been possible to rearrange and improve the schedules used, also the methods of tabulating and summarizing the reports. Five of the six regular reports which are prepared and released by this Section each month are now tabulated by hand instead of by the Machine Tabulating Unit. The sixth report will be hand-tabulated at an early date. The hand-tabulation method has permitted a finer breakdown of items at less cost and has speeded up the work. The monthly cold storage report for many years consisted of a single page release of data without comments. The new monthly cold storage release - a 5-page report - has been commented upon favorably by the press and by the cold storage warehouse industry. This improvement has been brought about quickly only through the fine cooperation of the Cold Storage personnel, together with suggestions from other divisons of the Bureau and the general guidance of the Bureau sub-committee for Marketing Statistics.

The question has been raised as to the completeness of the coverage of the cold storage schedules. At the present time we are making investigations as rapidly as possible, state by state, to determine certain facts concerning the adequacy of coverage. One month ago cooperative arrangements were made with the State of Virginia Department of Agriculture and Immigration whereby that state discontinued sending monthly schedules to its list of cold storage warehousemen. The Dairy and Food Division of that Department has agreed to make a release of the Virginia data which are to be supplied from Washington. This action eliminates the duplication of reports by Virginia cold storage warehousemen. We intend to continue with such moves in other states whenever and wherever cooperative action is possible.

Returning to the status of the Virginia reports and their coverage, we found that five plants that were reporting to the Virginia State Department of Agriculture were not on our list in Washington. We immediately investigated and discovered that these plants were not strictly cold storage warehouses but were "refrigerated depots" or packers' "branch houses," which hold supplies for only a week or two prior to their delivery to retail merchants, whereas cold storage warehouses are considered those in which food commodities are held or stored for 30 days or more at a temperature of 45 degrees Fahrenheit or below. The State of Virginia maintains a list of food inspectors who make periodic trips to all cold storage plants in the state. After a recent careful check, these inspectors stated that our coverage in their state is one hundred per cent except for these few "depot storages."

This also brings up the question of coverage in the United States for cold storage warehouses which hold food commodities less than 30 days. We estimate that there are from 2,000 to 2,500 of these cold storage plants which are of the "depot" or "current stocks" type. The total holdings in this group probably would not represent over 10 to 15 per cent of the total holdings in cold storage, but certain commodities which move quite rapidly from cold storage to retail markets would be held in these depot storages in fairly large quantities. Supplies of certain "quick-freeze" fruits and vegetables and case eggs are some of the important items which might fall in this classification.

During the past 5 years the rapid growth of the "quick-freeze" industry has brought about startling changes in the administration and operation of cold storage warehouses. The Cold Storage Report Section has tried to keep pace with the demand for more and more statistics relating to the "quick-freeze" industry, but it will be next July before our new printed schedule will make a breakdown of these items so that "quick-freeze" fruits and vegetables can be separated from the ordinary frozen and preserved items. There are unlimited possibilities in the cold storage field and, correspondingly, much work in the field of cold storage statistics.

THE DAIRY AND POULTRY MARKETING STATISTICS SECTION

On the first of the year, this section was transferred from the Dairy and Poultry Division to our group and with it the responsibility for the preparation and release of the following reports:

1. Annual Manufactured Dairy Products Report, by Months and by States.
2. Monthly Butter and Cheese Production Estimate.
3. Monthly Hatchery Report.
4. Monthly Egg Breaking Report.
5. Monthly Canned Poultry Report.

Mr. Newell has cited a few examples of the need for studying the value of certain indications in these reports, especially the probable limitations of the use of identical comparisons. The Dairy and Poultry Statistics field is one that needs some very careful research as to lists utilized, sampling methods, and use of indications before evolving definite plans or changes in the present procedure. This research work is going ahead rapidly. Mr. Callander has had many of us at work on this problem. The various committees which have worked with Mr. Bennett have not as yet developed well-organized lines of approach that will solve a majority of the problems. Some changes in schedules and in sampling methods are proposed and will be considered in other talks and meetings during the week.

MANUFACTURED DAIRY PRODUCTS REPORT

B. H. Bennett,
Associate Marketing Specialist, Washington, D. C.

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The Bureau's Report on the Production of Manufactured Dairy Products, by Months and by States, which was recently transferred to the Division of Crop and Livestock Estimates from the Dairy and Poultry Products Division, was started in 1917, under the provisions of the War Emergency Act.

Under the War Emergency Act, a Federal report was required of all manufacturers of dairy products, under a severe penalty. But the feature expired with the close of the war, and from then on reports had to be obtained from manufacturers on a voluntary basis. To overcome this weakness, as well as to meet other objections, the Dairy and Poultry Products Division began to develop a series of cooperative agreements with states having specific laws compelling producers of dairy products to report production and other data to designated state agencies or officials. These agreements had two main objectives: first, to make available to the Bureau the legal resources of the states in obtaining complete reports from all manufacturers; and, second, to eliminate duplicate schedules sent to producers of dairy products by the Federal and State Governments. Manufacturers were and are still greatly in favor of this latter objective.

In most of the states where cooperative agreements are in effect, the state part of the agreement is handled by the Agricultural Statistician, but in the others by state officials, usually the Dairy Commissioners or someone working closely with the dairy industry. These officials have to be appointed as Federal Collaborators, without salary, so that they can use the Federal frank in collecting reports from manufacturers.

The cooperative agreements provide for a complete mailing list of dairy manufacturers for each state, to be maintained in the Washington office on the basis of listings or changes supplied by the Agricultural Statistician or Collaborator, from which schedules are addressed and sent direct to manufacturers. These schedules, however, are accompanied by return envelopes bearing the name and address of the Agricultural Statistician, or Collaborator, to whom the schedules are to be forwarded after being filled in. When these schedules are received in the field or state office, they are recorded and edited, and then forwarded to Washington for tabulation. All follow-up work must be done in the field, and a tabulation cannot be made until the enumeration is complete. If a manufacturer fails or refuses to report, proper legal action must be taken to force him to do so. This is done, of course, under the provisions of the state law.

Up to the present time, all of the schedules listed in Washington have been tabulated on Hollerith machines. The tabulations are made in duplicate and one copy is sent to the Statistician or Collaborator. A state summary is also sent along.

There are, of course, modifications of this outline to meet the special requirements in the different states. While the list of manufactured dairy products on the schedule is kept uniform for all states, any number of additional questions may be asked on subjects in which the state offices are particularly interested. While it is our general policy to mail all schedules direct to manufacturers from Washington, this is not done in all cases. In some states the schedules are mailed in bulk, unsealed, to the state offices, where additional material may be included, and mailed separately from there. Furthermore, semi-annual schedules are used to obtain reports collected direct from Washington, and in most of the states where cooperative agreements are in effect, but a few states collect monthly reports and one state an annual report.

At the present time we have a list of thirteen to fourteen thousand manufacturers of dairy products to whom monthly, semi-annual or annual schedules are sent. When these schedules are returned to Washington, an entry is made on a card bearing the firm's name and address, of the code number of the commodity or commodities manufactured. In this way we have a record of the various commodities manufactured by each firm over a period of years. The schedules are then carefully edited before being tabulated. When the tabulation is completed, it is checked back against the schedules for errors in tabulation, and also for omissions in editing. This is done for each of the 48 states on about 32 commodities. Each state must then be summarized by months and by commodities, and then a total summary made for the United States. In 1936, for the first time, a special report was published showing the production of each commodity by states and by months.

The major part of the work involved in the preparation of the manufactured dairy products report is centered in four to five months, mostly from March to August. Handling so much detail in such a short time by a unit of only three clerks, even though exceptionally qualified and experienced, makes it impossible to complete the report any earlier than it has been released so far.

It looks as though the answer to this problem is decentralization, in some of the states where we now have cooperative agreements, and where the dairy industry is of sufficient importance to justify the additional expense brought about by decentralization. Decentralization to a partial extent has already been accomplished in New York, Minnesota and Wisconsin. Additional states will probably be decentralized before the end of the year.

Decentralization, where feasible, has definite advantages from both a state and Federal standpoint, although in most cases it means increased costs over the present method of handling. As there is little likelihood of any funds being available on this project it will be necessary to sell the idea to the states in order to get the necessary

financial support to carry it on. Most of the states are now "dairy minded" and others are becoming so each year, so that the plan should not be as difficult to put across as it would have been a few years ago.

It is impossible to say at the moment what additional states will be decentralized. This is a question for further consideration, as decentralization in each state presents a separate problem. In a number of states the dairy industry is not of sufficient importance to justify decentralization; in others where the industry is important, it would not be practicable because such states do not have a licensing law which would give us some measure of control in forcing manufacturers to report. Such states will continue to be handled from Washington. In these states, however, the field offices can be of considerable assistance to us in obtaining reports from delinquent manufacturers through personal contact or through the State Extension people. We will feel free to call on them for help from time to time.

In decentralization one important factor that must not be overlooked is that the report is based upon a complete enumeration of production of all manufacturers of dairy products. This means that a constant check must be kept on firms coming in or going out of business, and that delinquent reporters must be followed up aggressively. Probably 50 to 60 per cent of the schedules will be returned immediately, but the remainder will be increasingly difficult to obtain down to the last report. This job may call for considerably more detailed work on the part of the field office than is required in estimating total production of field crops on the basis of sample reports.

We also make estimates on some manufactured dairy products, but for current use only. Since 1926, a monthly estimate has been made on the production of creamery butter, and since 1931, on American cheese. These estimates are of temporary use only, and are discarded when the final figures on production become available. This subject will be discussed in more detail by another representative of the Division from the Washington office.

DAIRY STATISTICS IN WISCONSIN

Walter H. Ebling,
Senior Agricultural Statistician, Wisconsin

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Some forty years ago we began the first collection of statistics on manufactured dairy products under a Wisconsin State Law. Because of the large number of plants in Wisconsin and the nature of many of these plants, the task of collecting these statistics in our state is a large and difficult one. The number of plants in the state is far greater than that found in any other state, as is the volume of milk produced. Of the Wisconsin milk production, between 80 and 90 per cent finds its way into manufactured outlets, which is quite unlike the situation in the Eastern States where a large part of the milk produced regularly flows into the city markets.

The work in the Bureau of Agricultural Economics in this field developed after the World War and for more than a decade it duplicated in considerable part the work done in alternate years under the Wisconsin Law. In 1929 the state transferred the work of dairy statistics to our unit. With this transfer it became possible to work out a cooperative arrangement with the Division of Dairy and Poultry Products and thereby eliminate the duplication of effort which existed. This, however, meant the shifting of the state's work from a biennial to an annual basis; and instead of annual totals, monthly production figures were now collected.

In the beginning of this cooperative work we used the Bureau's semi-annual schedule which got six months of production on a monthly basis at one time. Compared with the state's method of getting annual figures on production and value, this collection of monthly data, especially by means of semi-annual schedules, became a staggering task in our state. With the large number of plants and the necessity of getting them all under the State Law, the semi-annual type of schedule created so much work in the form of follow-up and checking that it became practically a year around job for a considerable part of the office.

One year's experience, however, suggested that if all of the material for the entire year, even though left on a monthly basis, were put on a single annual schedule, it would greatly reduce the volume of work. Such a schedule was prepared and given a trial for the collection of the 1932 data. The volume of work was reduced greatly, especially in the matter of follow-up and correspondence, and the success of the annual schedule has justified its continuance since that time. The annual schedule is one of the major contributions that has so far arisen out of the Wisconsin experience, and it has been found efficient and economical.

With the transfer of the collection of these dairy data to the Division of Crop and Livestock Estimates some changes will result in Wisconsin. Up to now the tabulations have been made in Washington by the use of Hollerith machines. We have always made a tabulation of the annual totals, partly as an insurance against the loss of our data when the schedules were shipped to Washington for tabulation and partly to get preliminary totals early. Under the new arrangement, all of the tabulations will be made in the state office, and we are finding it a surprisingly large job because of the immense number of plants in the state.

We are looking for additional economies in handling the material. We question now whether it is worth while to make complete monthly tabulations of the more important items, such as butter and American cheese for all of the plants in the state. With some 15 or 16 hundred plants reporting American cheese, it is believed that the monthly distribution of the quantities annually manufactured could readily be derived by a partial tabulation of these, thus saving a considerable amount of work and time. With about 550 plants producing butter, it would also seem that the distribution by months of the total annual production can be accomplished by a partial tabulation, thus eliminating a considerable amount of costly routine work. For the minor items reported by fewer plants, it is probable that a complete tabulation on a monthly basis will still be necessary in order to get accurate distribution throughout the year.

For the 1937 data, which are now being collected, it seems that we will need to make a complete tabulation in order to get our material well in hand the first time we are carrying the full detail. In subsequent years it may be possible to accomplish the same results with partial tabulations for the major items. Just how successfully these proposed simplifications will be, one cannot be sure at the moment, but we believe now that there is no good reason why these devices cannot be substituted for the methods used this year.

A word needs to be said, too, about monthly estimates of butter and cheese production. Undoubtedly these will be decentralized for the more important states but it is believed wise to delay making such estimates in our office until the methods are more fully developed in Washington. When this is done we will no doubt undertake monthly estimates in Wisconsin because these estimates, if made early enough in the month, can be published with our regular crop report.

One of the important developments in this work so far as the Wisconsin experience is concerned is the opportunity which it gives the state office to publish dairy data in detail. It is believed that with the transfer of this work to the Crop Estimates organization it will be tied more closely to the other agricultural statistics work, thus speeding up these reports and making them more attractive and more useful to the industry.

Another development about which we are now thinking in Wisconsin is the possible combination of our present dairy schedule with that of

The United States Census Bureau. The biennial census of manufactures still duplicates some of the work on our dairy plant schedule. This matter has been discussed with Mr. Pettet and Mr. Austin of the Census Bureau, and I am glad to report that they are interested in eliminating this duplication provided a satisfactory method can be worked out. We are hopeful that this may in time be done, which would mean that only one report on production would be requested from a dairy plant and the report would serve all agencies.

SOME PROBLEMS IN DAIRY MARKET STATISTICS

R. K. Smith,
Dairy Section, Washington, D.C.

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For convenience, I have roughly considered the Dairy Statistics in four groups. The first, which is entitled: "Fluid milk and cream consumption in cities and villages," is an annual report and consists of regional estimates of average per capita consumption and total consumption of milk, including the milk equivalent of cream, by non-farm population. Thus far, it has largely represented a yearly trend projected from a base established for 1930. The trend is based on year-to-year changes as indicated by reports collected from city boards of health in a few cities of over 10,000 population, assuming that they are representative of changes in all cities and villages, regardless of size. This one report probably gives rise to more problems than any of those transferred. It is one of the more important segments of the whole dairy picture and one on which very little progress has been made because of the complexity of the problem. This report has been placed under the supervision of Mr. Shepard.

The second group includes the monthly report on condensed and evaporated milk stocks and production as well as the monthly report on dry milk stocks and production. These reports were included in the original order of transfer but have not yet been taken over by the Division. These are tied in rather closely with monthly reports on prices of these products and require a rather close contact with the markets. Since these reports are based on information furnished by firms rather than individual plants, it is probable that they will continue to be handled entirely from Washington.

The third report transferred was the annual report of dairy products manufactured. This covers all products manufactured from milk, collected by months on monthly, semi-annual, and annual schedules. Of course, one of the greatest problems here has been and still is that of completeness. A great deal of progress has been made in this respect during the past few years through cooperation with state agencies. Since the enumeration is made largely by mailed questionnaire, the matter of complete, active and up-to-date lists is of great importance. Clean-up work requires much time and effort; it requires more effort to get the last two per cent of the plants to report than the first twenty per cent. Often personal contacts are needed and this is one place where the state man may be of material assistance even though the work of handling the enumeration in their state has not been decentralized. Timeliness is important and we should put forth a concerted effort to publish the plant data for each year as early in the succeeding year as possible.

Speaking of decentralization, there are many details in connection with it which will require considerable time to work out satisfactorily. It seems to me that it should only be considered at present in states having laws which require reports on dairy products manufactured, either monthly or annually, and where there is a cooperative agreement between our Division and the interested state agencies. The extent to which the state enforces existing laws is important. There must be an interest on the part of those who will do the work in the state, including our own men, and a complete understanding between those in charge of the work for the state and those in our local offices as to the personnel and funds involved and the responsibilities of each party. In a majority of cases, it would seem preferable to have the responsibility of the tabulation in our own office. Such a policy would result in decentralization of the annual enumeration in few states outside of the more important dairy region. Three states have already been decentralized and it is possible that during the next year satisfactory arrangements may be made in a half dozen or so other states. Approximately forty per cent of the plants reporting in 1936 were located in the three states already decentralized.

Let us consider now the monthly estimates of butter and American cheese production, which make up the fourth group of reports. It is here that the methods of estimating as developed in Crop Estimates seem likely to offer the most assistance. Speaking first of the creamery butter estimates, the present method makes use of an identical plant comparison with the same month of the previous year. A sample of plants has been selected for each state which in the past has reflected closely the monthly distribution of creamery butter production as shown by the annual enumeration. These plants are sent a card at the beginning of each month, on which they report the production for the previous month. A card record is kept of the reported production in each plant. The sample each month includes all plants reporting up to the closing date, if the figure for the same month the previous year is available. Frequently, it is necessary to wire certain important plants in order that their production may be included in the sample. An estimate is made for each state by relating the production for the same month the previous year to the current production that month, and building up to one hundred per cent the production shown by the sample. In many instances, adjustments have been made in certain states allowing for new plants starting up or plants which have gone out of business, or for what appear to be unrepresentative changes in the sample indications. For the past several years, the estimates for the country as a whole have usually been too low compared with the final enumeration, but this has been due in part, at least, to the rather continuous pick up in completeness of final enumerations. With the final enumerations now about as complete as it seems possible to make them, an extensive research program needs to be inaugurated to see if the monthly estimates, particularly by states, cannot be improved.

The present sample represents a much larger proportion of the total monthly production than most of the samples we use for estimating crop production. It varies from about twenty-five to thirty per cent of total monthly butter production in Minnesota and Wisconsin, to almost a complete

enumeration in some of the lesser states. In Montana actual totals are used of a complete monthly enumeration required by the state. However, the sample includes most of the larger manufacturing plants and the changes are not always representative. Perhaps by studying the location and size of the plants within the various states, a more representative sample might be developed. The use of charts similar to those used in some of our other work seems to offer possibilities. We are now bringing together considerable basic historical data for this purpose.

The development of check data will probably depend somewhat on the state involved. Monthly receipts at four markets from Wisconsin show a very close relationship to monthly production in that state for at least nine months out of the year. This may offer possibilities in some other states such as Minnesota, Iowa, Nebraska, Kansas, the Dakotas, etc. It might not be helpful in Illinois because of reshipments out of Chicago. Another approach may be through the use of identical comparisons, using months other than the same month the previous year as a base. In the present tabulation, the production for the previous month is carried mainly as a check item. This might be helpful as an indication in certain states although it is realized that one would be using an estimated figure as a base. For check purposes, it might be helpful, however. Undoubtedly, as the study of these problems continues, other checks will be developed.

All of the problems of making monthly estimates of butter come up in the estimates of cheese production, and many more in addition. Here the size of operation and the investment in equipment is generally much smaller than in the butter industry. The production is highly seasonal, with many plants only producing during the summer months. Also the possibilities of shifting to other types of production are much greater. State estimates are published only for Wisconsin and New York State, which produce close to sixty per cent of the American cheese.

The matter of timeliness of release is of importance. There is now a drive on by certain members of the industry to get the Bureau to publish weekly indications of change in butter production. I believe this could be met in part by an earlier release of the present monthly estimates, say not later than the 15th of the month following. To do this would undoubtedly require contacts with certain concerns, particularly those which insist that the plant reports be made from the central office. It might also require some changes in the present sample to include plants which could and would report promptly. Undoubtedly, decentralization of the more important states would aid to speed up the release. I feel, however, that a considerable amount of research should be done in Washington on methods of estimating before decentralization of the monthly estimates is attempted in many states.

The transfer of these various reports to the Division has greatly increased our possibilities of service to the dairy industry. It should now be possible to coordinate much more closely the work on production of milk and the ultimate utilization. It is hoped that we may be able to develop some of these data further in order to check more fully on our state estimates of production. Increased state interest is sure to

result from the establishment of milk control boards, health regulations, and restrictions on Soil Conservation payments as provided in the new Agricultural Adjustment Act. We should be in a position to meet these needs as they arise. There are still a number of places where the data needed are very weak or almost wholly lacking. One big field is that of consumption of fluid milk and cream. Another is receipts of milk and cream at plants. Our program of development should include, along with improvements of methods, the interpretation and publication of timely data in a popular, usable form.

THE HATCHERY REPORT

B. H. Bennett,
Asso. Marketing Specialist, Washington, D. C.

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Those who have been associated closely with the poultry industry during the past 15 to 20 years have had the opportunity of observing some remarkable and interesting changes. The growth of the commercial hatchery industry has been particularly outstanding. With the possible exception of increased knowledge of disease control through improved sanitation, no one factor has had a greater effect upon the poultry industry than the commercial production of baby chicks.

At the close of the World War a great majority of the chickens raised were home hatched, either in small incubators or under hens. From 1920 to 1930 the advantages of buying commercially-hatched chicks began to be recognized, particularly by large scale egg and poultry producers who preferred not to be bothered by hatching or breeding problems. A survey made by the Division of Crop and Livestock Estimates in 1928 showed that at that time approximately one-third of the chickens raised by reporters were bought from commercial hatcheries. Another survey made in 1934 indicated that this proportion had increased to almost one-half, and at the present time it may be even more.

Since 1929 the Bureau has published a Monthly Report on the production of Commercial Hatcheries. This report was started by the Division of Dairy and Poultry Products, but on January 1 of this year was transferred to the Crop and Livestock Division. The first reports covered only the months of March, April and May, but they now are issued for the main season of January to July, inclusive, for all states, and October to December in certain Eastern and Middle Western states where the fall and winter broiler industry is of considerable importance. A special report for California is compiled throughout the entire year. The purpose of this report is to indicate in advance the number of chickens likely to be raised, and future marketings of eggs and poultry meat.

The hatchery report is not an estimate of the total number of hatchery chicks produced each month. It is merely a comparison of the operations of identical firms, this year and last. As the sample has, however, some 15 to 20 per cent of the total number of chicks hatched commercially, it is felt that the report is a representative reflection of changes in the total output.

The sample of reporting hatcheries includes only plants with a hatching capacity of 10,000 eggs or over. Schedules are sent to approximately 1,500 plants, out of a total of six to seven thousand of this capacity. About seven to eight hundred usable returns are received at

the peak of the season. No effort heretofore has been made to stratify the sample based on the distribution of the total number of hatcheries according to size or location.

Weighting the sample by capacity classes and Grand Divisions would undoubtedly result in an improvement in the report, but this could be done only by having a complete enumeration of the entire hatchery industry made at stated intervals. The only survey of this nature ever made was that of the Agricultural Adjustment Administration in 1934 as a part of the National Hatchery Code. It is now proposed to make another survey, this time jointly between the Poultry Section of the Agricultural Adjustment Administration and our Division. Agricultural statisticians have already been advised of this project in Special #256.

The principal criticism of the Hatchery Report heretofore has had to do with the timeliness of its release. For the first few years, it was released around the 23rd of the month following the one to which it applied, but several years ago it was moved up to the 15th. Last year, it was decided to issue a preliminary report around the 8th or 9th of the month, which would include all early returns, and then follow with the regular and more complete report around the 15th. The latter report also includes state figures, sexing data, and information on the number of turkey poults hatched. This plan is being followed again this year with satisfactory results, although it would be much better if only one report could be issued, and that along with the Division's regular monthly report on the 10th of the month.

Probably the only way a complete early report could be released would be through decentralization, although we have not yet had much opportunity to give this possibility much consideration. Decentralization, particularly in some states, would undoubtedly hasten the collection of the monthly reports, and make it possible to obtain a more representative sample by states on the basis of numbers and size of plants. By including in the monthly questionnaire special questions of local interest only, decentralization of the hatchery report would furnish an opportunity to strengthen our state relations without much additional expense.

In contrast to the Annual Report on the production of manufactured dairy products, decentralization of the Hatchery Report would not increase the costs of the field offices to any great extent. The largest number of reports required as a sample for any one state would likely not be more than 75 to 100. After contacts with reporting hatcheries were once established, the follow-up work would probably be small. Listing and tabulating returned schedules would not require any great amount of time or clerical help.

Because of the three weeks lag between the time an egg is set and the chick hatched, an increase or decrease in the production of chicks by commercial hatcheries compared to the preceding year is indicated in advance by a corresponding change in the number of eggs set. Changes in the number of eggs set, however, cannot be measured

at the beginning of the month, but are accumulative over the entire month. A comparison between the number of eggs set and the number of chicks hatched for any given month will indicate in advance what may be expected in the way of chick production early in the following month.

It has been suggested that our present monthly report might be supplemented by reports from a selected group of hatcheries as of the 15th of each month, showing the number of eggs set during the preceding two weeks compared to the number set a year earlier. Probably not over three hundred reports from a properly selected group of hatcheries would be required for a representative cross section of the industry. The reports could be made by telegraph or air mail if direct to Washington, or by regular mail if made to the field offices and summarized there and telegraphed to Washington. The preliminary report would be released as at present, but the publication of the regular report would be deferred a few days in order to include this additional data. We would like to have your reaction to this suggestion, both as to its value and how it might be handled at minimum cost through the cooperation of field offices.

POULTRY MARKETING STATISTICS

Leslie M. Carl,
Statistician, Iowa

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A discussion of poultry marketing statistics for Iowa takes account of the fact that we are entering what may be termed an unexplored field. A program that will give certain types of information promptly to our Iowa poultry interests is certain to receive favorable support. Several organizations have commented favorably upon the market statistics available and all are in agreement as to greater utility of the various reports, if released promptly and not after the need for them has passed. It also seems to be the general opinion that more prompt service might be secured by decentralization. I could not agree to a decentralized program, however, unless assured of adequate administration by a more or less specialized personnel.

Baby Chick Hatchery Reports:

The season for operating commercial baby chick hatcheries is of short duration, in which period hatchings may overrun sales, or demand may exceed supply, according to the purchases of farm producers. Our hatchery people want an early-season report on intentions of farmers to purchase baby chicks.

The report of intended farm purchases of baby chicks as indicated by crop correspondents on Feb. 1 is timely and should give the hatcheries a fair conception of probable sales of baby chicks. Our hatcheries and marketing agencies are interested in the report for individual states. This intentions survey of February 1, although giving some information on prospective purchasings, does not show the change in plans made later in the season. A similar inquiry should be made on the first of March and again in April.

Output of hatcheries should be followed at weekly intervals, since the season is short. Effort should be made to secure weekly reports from every hatchery, and indications should be based upon matched returns. A weekly report should include such items as: (a) capacity; (b) number of eggs put into incubator; (c) number of eggs hatched; (d) number of chicks sold or delivered; (e) percentage mortality of chicks; (f) average price received for chicks per 100.

Weekly hatchery reports are needed but it is obvious that to give such service places a demand on the state office for a clerical organization sufficiently large to do the work. A Junior Statistician should be assigned to this program, with adequate clerical assistance.

I am quite certain that the Hatchery Division of the Iowa Poultry Improvement Association will cooperate with us in a hatchery reporting program.

Report of Egg Breaking Operations:

We have about a dozen egg breaking plants in the state, and a monthly enumeration of each plant should be possible if personal contact with the management of each plant be made in advance.

Disappearance of Poultry Products:

Records of shipments of live and dressed poultry and eggs to the four or five major markets as are now collected by the Bureau may be the extent of our program for the present. It may be feasible through our carlot shippers association to gain the cooperation of the larger shippers for reporting monthly shipments; but it would be inadvisable to attempt to secure records from a very high proportion of our 3,400 poultry dealers, many of whom are regularly shipping by express, freight and truck to local markets and to neighboring states.

Turkeys:--Estimates of Production and Marketing:

Interest in Iowa turkey production has increased materially in the past five years. Commercial production of turkeys has grown rapidly and turkey estimates will be viewed favorably only if our estimates are reasonably accurate. The Iowa Turkey Growers Association may be expected to cooperate with us but we must release our turkey reports promptly and give the turkey producers something in return for their cooperation.

Collection of more marketing data should be possible through provisions of the licensing laws of the Iowa Department of Agriculture and this Department will cooperate in this way if the Bureau will compile the information. Inasmuch as the Iowa laws provide for licensing various types of establishments, it may be advisable to secure records of poultry processing and marketing, by means of a cooperative schedule similar to the Dairy manufacturing reports.

Summary:

In summarizing, it is my opinion that the statisticians in the state offices must be the active missionaries in developing a program of poultry marketing statistics. Upon them, also, falls the role of educators, not only to teach the value of market statistics, but to cultivate the demand and arouse enthusiasm for cooperation.

I recommend decentralization of the program, as it relates to Iowa, if by so doing we can best serve the poultry industry in the state. I recommend a well-balanced, full-coverage program, over which a Junior Statistician or Marketing Specialist shall be appointed for making the necessary survey and otherwise contacting the industry.

MARKET STATISTICS ON POULTRY AND EGGS

E. S. Kimball, Jr.
Poultry Section

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It seems to me we should consider seriously the use of market data in their relationship to poultry and egg estimates, especially monthly income estimates. Discussions in the B.A.E. indicate that we will be called upon to make monthly estimates of farm income before long. When this request is made, we should be in a position to handle the situation.

We may assume for purposes of income that eggs leave the farm during the month in which they are produced. In order to get monthly income from egg production we need only to estimate the value of monthly egg production. If we wish to get monthly cash farm income from eggs we can use the quarterly returns on farm egg consumption to construct a curve from which we can obtain monthly farm egg consumption, which is deducted from farm income to get cash income. In the spring of the year certain allowances will have to be made to take care of eggs used for hatchings on the farm.

However, estimating monthly income from poultry is not so simple and requires considerable study. Of course we have the published records of receipts of poultry at the principal markets, which are very helpful for some states. For other states which send only a small portion of their production to the principal markets, the information is almost worthless. Therefore, in order to make reasonably accurate monthly estimates of poultry income in many of the states, we must collect additional information on poultry marketings.

There is a mass of poultry marketing data which can be collected without too much effort. In many states there are cooperative associations which market a large proportion of the poultry and eggs produced. There are also many private organizations which handle large amounts of poultry and eggs. Many of these associations and private concerns have large poultry killing plants. They have records of marketings which are readily available, such as number of birds dressed, number shipped alive, average weights per bird prices paid to farmers, breeds killed and other helpful information to supplement our scanty supply of reliable marketing statistics. A close contact with these marketing organizations will enable the state offices to obtain valuable information concerning the production and general movement of poultry and eggs, the "in-and-out" producers, trends of production, and operations of special types of producers, such as battery producers.

Turkey production is more commercialized than chicken production and the growers are generally better organized. These associations

have fairly long contracts with the turkey producers and keep a close check on production. Some of them get intention reports at the beginning of the year of turkey production. In many states the associations handle the bulk of the turkeys produced. Some of them have their own killing plants which dress most of the birds. Information on number of birds, average weights alive and dressed, prices paid to producers, etc., is readily available. The Northwestern Turkey Growers Association is made up of several state associations and markets practically all of the turkeys not sold within the states where produced.

One of the weaknesses in our annual average price of chickens is improper weighting. In many states we have only the receipts of poultry at the principal markets as a basis for weights. These are wholly inadequate, especially in those states which ship poultry out of the state only during two or three months of the year. Almost any information collected in these states on monthly marketings of poultry would be better than what we now have.

In the past, very little use has been made of the Commercial Hatchery Report in making estimates of chickens raised. When used at all, it was only as a rough check on regional estimates, and for a few states. However, we are now gathering information on the source of chickens raised, which will enable us to make better use of the hatchery report. Once we have a reliable indication of the per cent of chickens raised which are purchased from commercial hatcheries, we can use the per cent change as the number of salable chicks hatched from year to year as a direct indication of chickens raised.

Some of the states are now publishing monthly feed-chickens and feed-egg ratios. Other states wishing to do so must first determine what is a typical poultry ration for the state and then assemble a series of prices paid by farmers covering the ingredients of the ration. When a large part of the feed fed is in the nature of commercial mashes and mixed scratch grains, a series of these prices must be assembled. If it is impossible to get an average price for the state as a whole, a central point can be selected and prices paid by farmers at that point can be used. If the series is published it should be clearly defined or it might be misleading.

If we are going to improve our poultry and egg estimates and make monthly estimates of production and income, the state offices should make a special effort to collect marketing information, keeping in mind the kind of marketing information needed to meet the specific problems involved.

HAY SEED PRODUCTION ESTIMATES

J. H. Peters,
Statistician, Washington, D. C.

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Estimating the production of crops so highly specialized and localized as the seeds will require techniques different from those used for the more universally grown field crops.

The hay seed job now before us differs from what we have heretofore been doing with seeds in two respects:

1. It includes more kinds of seeds.

2. It carries with it responsibility for the preliminary estimate at the time of harvest.

The additional seed crops center in small areas and concern only a few states. The list of seeds we will report is not closed by those named in the instructions. If in any state there are seeds of importance not yet included, let us hear of them. Most of you are concerned with the main seed crops that this Division includes in the December Crop Report.

The feature of our added responsibility is a preliminary estimate of production at the time of harvest. This is not new. Such estimates have been made for a long time by another Division of the Bureau. Our goal is a preliminary estimate of production as soon as harvest is sufficiently advanced for farmers to report what is certain regarding their harvest. We will depend primarily on farmers as sources of data on acreage, yield per acre, and production on individual farms.

This will require a special schedule for each seed crop and a special seed-growers' list. Special lists do not appeal to any of us. I wish there could be a way to avoid them. But there is no other way to get reports from a sufficient number of individual farms. So the establishment of the special lists is under way, as is also the preparation of suitable schedules. Your country point banker can tell you the growers of seeds and the firms that buy from farmers.

Use of individual crop schedules to special lists of seed-growers is one method; another is contact with seedsmen. Use your key men, by personal visits or long distance communication. Schedules to seedsmen will be mailed out of Washington and tabulated there.

There may be a tendency for seedsmen to define production as the volume they are likely to handle. Our definition of production is the total crop.

Our production is purported to be "farm run" or "thresher run", "as is", before recleaning. But I ask you, what is it? Mr. Ewing will discuss some facts about dockage he gathered in the office of the seed analyst in Maryland. The significant point in connection with dockage is this: is our definition of production comparable between quantity produced and farm price?

How effective is field travel in gauging the size of a seed crop? The concentration of the crop has a lot to do with it. If the producing area in one of your states is concentrated in four or five counties, then by all means drive it. But if there are scattered farms growing the seed all the way from the hills of Habersham to the washes of St. Mary's, driving it will not do you much good, and you can make use of mail and telephone to better advantage.

Although in the instructions the seed report dates are set to fall on crop report dates, there are some very good reasons for spacing the seed reports on other dates, such as: (1) avoiding the peak load at crop report time; (2) providing time for the necessary field travel apart from preparation of the crop report; and (3) permitting different distribution of the seed report, to seed-producing farmers and seedsmen.

DOCKAGE IN HAY SEEDS

J. A. Ewing,
Statistician, Maryland

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Dockage in hay seed is any material except the seed itself. This foreign material may be weed seeds, parts of stems, chaff, crop seeds other than hay, sand, dirt, and even pieces of hay seeds. Dockage is important for the reason that the percentage of foreign material is probably larger in hay seeds than in any other farm crop. Hay seed as it comes from the thresher, huller, or combine, may contain foreign material varying from a negligible amount to well over 50 per cent, depending on the crop being harvested and the gleaning efficiency of the harvesting machine. The grower may re-clean the crop on a small fanning-mill or he may take the machine-run seed to a local dealer for re-cleaning on a somewhat more efficient machine. In Maryland, considerable seed is sold by the grower direct to the large wholesale seed houses. If the grower reports production on the basis of machine-run seed, his report contains all of the dockage. On the other hand, the grower may report his production on a re-cleaned basis. Due to the extreme variations, it is important that we know the basis on which the reports are made.

According to Mr. F. S. Holmes, Maryland State Seed Analyst, the State Seed Laboratory last year analyzed 185 samples of clover seed which were known to have originated directly from farmers. The percentage of pure seed ranged from 30.3 to 99.7. The average showed 91.7 per cent pure seed, 0.3 per cent crop seed, 1.7 per cent inert material, and 6.3 per cent weed seeds. The 185 samples represent only a small part of the production. We would expect the average dockage for the state to be considerably higher. Dealers say that dockage varies from 5 to over 50 per cent. They expect to get about 80 per cent of pure seed by weight from their purchases. In the seed producing sections farmers buy most of their seed direct from growers and it is our understanding that very little of this has been re-cleaned.

Timothy and other high growing hay plants have a rather small amount of dockage. Low-growing legumes usually have the largest amount.

INCREASING RURAL CARRIER RETURNS IN WEST VIRGINIA

Harley M. Brewer,
West Virginia

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The Rural Carrier Surveys in West Virginia have been characterized by small returns and more or less serious shifts in sample. A sharp drop in returns in 1935, which was not recovered the following year even after increasing the number of cards used in the survey, caused us to seek ways and means of securing a larger and better distributed return on the basis of the number of farms found by the 1935 census.

A tabulation of the June 1937 livestock cards on the basis of distribution channels revealed some interesting facts. It showed:

1. That the postmasters and rural carriers were distributing the cards and were doing a better job than we had given them credit for.

2. That the star route carriers were securing a proportional return and were an important factor in our surveys.

3. That returns were thinly scattered in many areas, indicating that the cards were being distributed but that they were not being filled out and returned to the mail boxes.

With this diagnosis to go by, the remedy suggested itself. Instead of urging the postmasters and rural carriers to return more cards, it was evident that we had to find some way to get more farmers to fill out the cards and return them to the mail boxes. The simple plan which was developed and put in operation with both the 1937 Acreage and December Livestock Surveys produced very good results. The cards were mailed to the post offices with a letter of appreciation to the postmasters and rural carriers for their past cooperation. About 2 or 3 weeks later a supply of "reminder" slips was sent out to the rural carriers to be placed in boxes of farmers who had not returned a card. At the time the reminder slips were sent out, returns from post offices had practically stopped. Between the "reminder" and the close of tabulations, returns on the Acreage Survey from post offices increased by nearly 50 per cent.

In addition to the reminder slip for the rural carriers we used a follow-up to those who had returned a card the previous year. The net result of the use of the reminder slip and the direct mail follow-up was an increase in both the Acreage and December Livestock returns of about 45 per cent over the 1936 returns. Returns on the December Livestock Survey were about 40 per cent greater than in June.

One of the postmasters who has had difficulty in getting a good return suggested that if he could have copies of the report to distribute among his patrons that it might help to get a reasonable response in later surveys. It has been our practice to send the report to all who respond, but in following this idea we would reach those who have not reported and who might thus be induced to do so.

A TRAINING COURSE FOR JUNIOR AGRICULTURAL STATISTICIANS

Emerson M. Brooks, Kentucky

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The work of this division has become so varied and complex in recent years that a Junior entering the service today is confronted with a bewildering maze of surveys, and, in his effort to learn the meaning of the results of these surveys, he doesn't find time to learn much about the routine but essential clerical work that went into the preparation of these reports. Therefore I am suggesting that in the future each Junior serve an apprenticeship of several months or perhaps a year as a clerk in one of the larger offices.

Until recently such a course of training as I am suggesting has perhaps not been necessary. Twenty or twenty-five years ago when most of the men now in charge of state offices entered the service, I understand it was pretty much of a hand-power set-up, and, as likely as not, the Statisticians themselves mailed out the schedules, opened those that were returned, alphabetized them, listed them, added them up and thumped out a report to Washington. As the work grew they grew with it. They inaugurated the June and September Rural Carrier Surveys, the November Acreage and Production Survey, the Pig Surveys, and worked out the details of handling a whole raft of special inquiries. This procedure has become rather routine now, but to a newcomer it is very confusing and complex. These older men no longer have to do clerical work, except occasionally in emergencies, but they know how to do every job in the office because they have done those jobs many times in the past. Because of that knowledge, they have some rather definite ideas of the time it takes to accomplish a certain amount of work, and in many ways are better qualified to be in charge of an office.

During his training period the Junior should time himself in such jobs as listing schedules, stuffing envelopes, running the addressograph, drawing up form headings, etc., so that later he will have some idea as to what to expect of others. He should be required to write a step-by-step account of the procedure in handling each of the different surveys so that he will think the problems through and have a complete picture of that part of the work. He should match identicals, check returned schedules, study the filing system, edit cards, work on the lists, and, in brief, do all those jobs which we usually think of as largely clerical. During this time he should learn to operate the mimeograph, the addressograph, graphotype, and other machines in the office, and should be shown how to make minor repairs and adjustments on all equipment, by representatives of the various companies. Required reading during this period would be the department's publications on the crop reporting service, sampling and kindred subjects.

At the end of his apprenticeship, it probably would be advisable to transfer the Junior to another office of the Division where he would spend a couple of years under the supervision of the Statistician in that office before being placed in an office as number two man. During these two years, he would concentrate on the major acreage and livestock surveys.

If his education has been deficient in mathematics, statistics, economics, soils, field crops or other essential subjects, he should be encouraged to study such courses, utilizing the best agencies available. A correspondence course conducted by the Washington office might prove practical. (Many state colleges already provide such correspondence courses. Ed.) I think the younger men should be encouraged and aided in securing Master's degrees but preferably not until they have been with the Division for at least five years, as it ordinarily requires about that long for a man's career to shake down to the direction that it is going to take.

SUGGESTIONS FOR THE IMPROVEMENT OF THE SERVICE

Oakley M. Frost,
Ohio

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There are still many suggestions to be made and I hope none will be overlooked by the long list of speakers yet to give their recommendations. The suggestions that I shall give may not be considered as important as some that will be given; however, I feel that they should be considered. They are as follows:

1. The need of standardization and simplicity of editing instructions. As the results of all our surveys depend largely upon the editing procedure that is followed, we should give more consideration to this part of the work. Certain definite rules should be set up so that the results from all surveys on a certain subject would be comparable. Too many times we change our ideas about the correct procedure to follow and therefore our results compared with past years are not similar. Men in the same office many times will not edit a survey the same way. Different states edit the same survey in different ways and, of course, the results are not similar. Many times incorrect estimates are made because of the misunderstanding of the editing procedure followed.

The editing instructions should be as simple as possible. This is very important because instructions that are clear and simple to the writer may be confusing to the users and misinterpreted by them.

It has been a long time since a set of instructions has been made for each commodity and I am suggesting that the head of each section in Washington make a new set for his commodity, bringing up to date the many instructions that have been given in past memoranda, as well as simplifying some of them.

2. The need of an adequate filing system. This suggestion is not applicable to all states, nor to the Washington office, but is applicable to a majority of the states. With an increasing number of different kinds of surveys, as well as the number of research problems undertaken by each field office, an adequate filing system should be followed. Also to be considered is the filing of publications of the Bureau, state colleges and other agricultural research agencies. It is necessary to use many of the publications in evaluating our own work and it is necessary, therefore, to be able to locate these items on short notice. An adequate filing system would also indicate the work that has been done in the field office. This is very important, particularly to new men in the different field offices.

3. The possibility of furnishing reporters with small books in which to record the information asked on the different general schedules. One of our aids refused to return his schedule unless we forwarded him two, so that he could keep a record of the data submitted. One difficulty with this would be that many reporters would copy the same condition figures month after month. However, it might tend to eliminate changes in condition figures when actually no change in the crop has taken place. The percentage of reporters using such a book would be hard to estimate.

4. Avoid overburdening a few good reporters with too many schedules. I have often wondered if we give much consideration to the number of questionnaires forwarded to some of our cooperators. No doubt this is one of the reasons why the number of returns is low. A larger number of lists or different methods of securing the information might help this condition considerably.

5. Reduce the number of times reporters are asked for the same information. For example, the number of times production of corn, wheat and oats is asked. We now get production of these three crops five times on our general schedule as well as on the acreage and production survey. Many of our reporters do not keep records and therefore they estimate their production every time the questions are asked. Many reporters, judging from their comments, are wondering about the continuous need of it. There should be some way to eliminate this difficulty

THE IMPORTANCE OF KEEPING SCHEDULES AS SHORT, CLEAR, AND AS APPLICABLE TO THE PARTICULAR LOCALITY AS POSSIBLE

Archie Langley, Georgia

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There are several topics that I feel could be discussed under suggested improvements, but I have selected "The Importance of Keeping Schedules as Short, Clear, and as Applicable to the Particular Locality as Possible."

To my way of thinking, this is a very important problem at all times. The future of our work depends on the cooperation of the crop reporters, and we should constantly be thinking about ways of holding our reporters and at the same time making it as easy as possible to get new ones. If this Division continues to grow in the future, it will be on the basis of the services it performs, and our reports must be accurate, to be of any real value.

Accuracy depends to a very large extent on the size of sample we have -- that is, if the sample is representative -- and with clear, short schedules we can hold our returns up. It is true that much progress has been made during the past few years in this direction but I think too much emphasis cannot be put on this idea. I am reminded of an experiment made in the Georgia office some time ago in testing our returns from the 456-M list, using two schedules on the same subject. The first schedule mailed out was a lengthy form, rather poorly arrayed and using more words than were necessary to secure the information. The other schedule had been reworked by Mr. McCandliss, a number of questions having been reworded in shorter and more concise form and the schedule rearranged to make it easier for the reporter to grasp at once just what information was wanted. Each of these schedules was sent to the 456-M list and the returns from the reworked schedules were four times those of the old form; and it was our opinion that the data secured from the short schedule were more usable.

In connection with this idea, I am wondering if we might not improve our December Rural Carrier Livestock Survey on cattle by eliminating several questions. In the southern states, duplication exists under the questions on heifers for milk and heifers intended for beef, and, also, there is some duplication under the various age groups for heifers, bulls and steers. If the number of questions under classification could be reduced, it would reduce the editing problem and increase our returns.

Our schedules are generally well adapted to conditions in our state but we feel that some of them could be improved. I am thinking

of the schedules on "Prices Paid by Farmers", and especially the one on farm machinery. I went over this schedule with the local Agricultural Extension Engineer and he was of the opinion that at least six of the questions are not suited to our state. There is probably no way to avoid this problem as long as one schedule is used for the country as a whole, but I am wondering if it would be feasible to have schedules for different sections of the country, similar to our general schedule.

COOPERATIVE WEEKLY CROP REPORTS

Miles McPeek,
Kansas

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For many years prior to 1937 two crop reports each week had been issued in Kansas. One was released on Monday by the Division of Crop and Livestock Estimates cooperating with the State Board of Agriculture. The other was released on Wednesday by the Weather Bureau. This system of dual reports was unsatisfactory and confusing to the public, especially when the reports carried conflicting statements, as they sometimes did. Apparently a satisfactory solution of the problem was to consolidate the two reports.

In the summer of 1937 a proposal was submitted for combining the two weekly reports. The necessary approval was obtained from the agencies involved and, as a result, a satisfactory plan for combining the reports was worked out. Since then, a joint Weather and Crop Report has been issued weekly in Kansas, in place of the two separate reports.

In the actual preparation of the report the Weather Bureau writes the opening paragraphs summarizing the weather and also prepares the precipitation table appearing on the back of the release. The Weather Bureau then gives us all its weather and crop information which we utilize in connection with our own data to prepare the crop story.

The present set-up is much preferable to the former one because we have eliminated the criticism concerning duplicate, conflicting reports; and also, by pooling the information gathered by both agencies, we are in a position to issue better reports than either office could independently.

I realize that there is probably a greater demand for frequent reports on crop conditions in the Great Plains area than in some other parts of the country. However, it seems that in any state the office of the Agricultural Statistician is the logical place from which crop information should emanate. And, since weekly crop bulletins are being issued by the Weather Bureau, and possibly by other agencies in some states, I believe more of our state offices should effect cooperative agreements with these agencies for issuing reports of this kind.

IMPROVING THE HAY QUESTION ON THE MARCH ACREAGE SURVEY

A. V. Nordquist,
Nebraska

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Tame hay acreage on the March crop acreage survey has offered considerable difficulty in the past. Relationships between this survey and harvested estimates, even in years of little or no crop failure, are very poor.

In the past it has been necessary for us to watch the March acreage reports closely in order to eliminate reports on wild hay. In some cases the reporter entered the acreage of wild hay under Item 12, the hay question on the March acreage survey, and designated it by writing in "wild hay." In other cases the acreage was entered under hay and no designation was made, but the large number of acres listed under hay led the Statistician to suspect that such an acreage report was wild hay, and it was edited out. It appeared then that if wild hay was entered in as hay without being designated as wild hay by the reporter in districts where the wild hay acreage was sufficiently large for the Statistician to detect this error, it was likely that the same situation would occur in other areas of the state where the average acreage of wild hay per farm is not very large and consequently cannot be detected by its size.

We matched the hay items on 523 identical reports for the 1938 March acreage survey and the 1937 June acreage survey. By comparing the acreage reported as hay on the March 1938 card with the aggregate total of hays reported last June, it was found that 32 individuals definitely included wild hay on their March acreage card without designating it as such. Because of crop failure entering into the picture, there were 13 other reports in which it appeared wild hay had been included. There were 13 other reports where wild hay was entered on the card but was designated as such by the reporter. A little better than a fourth of the reporters probably considered wild hay when filling in Item 12 on the March acreage survey and about 6 per cent of the total actually designated wild hay as such.

It seems that the reporter, in filling out the March card, probably doesn't give serious consideration to the question as it is now written and, in many cases, probably reads only the first two words, "hay and alfalfa." Others assume that the hay includes all hay and that the enumeration of alfalfa, timothy, etc., is simply a reference to what he is expected to enter in addition to any other kind of hay that he may have. Although grain hay is not specified by this question, some reports include it, which indicates that other reporters took the question to mean all tame hay. The fact that no reference is made to other or miscellaneous tame hays, other than sudan and millet for hay, tends to exclude these from the March report.

Some improvement could be made on the March acreage card by labeling Item 12 as "Tame Hay" rather than only as "Hay" and thereafter specify the kinds customarily shown. If the intent is to have the indications include grain cut for hay, it is important to add this item to the kinds enumerated. If the intention is to exclude it, then in all probability it would pay to make a note, "excluding grain cut for hay." In order to eliminate the wild hay hazard, we should prefer setting up an additional question asking for wild hay acreage, not for the purpose of using it as an indication in estimating the wild hay for the current year, but primarily to prevent wild hay from being included in the tame hay question.

DIVISION PROGRAM SUGGESTIONS

C. D. Palmer,
Iowa

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I have only a few general suggestions. The Omnibus, which Mr. Tuttle revived about a year ago, was very welcome to many of us in the field. New Methods used in one office that might be applicable to another are appreciated. The past year we have saved considerable time in the Iowa office in preparing headings for listing sheets by adopting the method used in California for several years. The system used is to cut regular mimeograph stencils and with an ink roller make the impression on the listing sheet. But at the very best this method is a poor substitute for printed headings.

It would save time in field offices if the condensation by topics of C. E. M.'s, special memoranda, and instructions, which I believe was started about a year and a half ago, could be published.

There is a definite need for classification as to what and how much research is desirable in field offices. It would seem that research could be coordinated to more productive results. However, if such coordination is carried to the point where the field offices feel that they are merely supervising the clerical work for a portion of the research program, the field office contribution will tend to be limited. Perhaps the general research program could be briefly outlined and definite results, whenever reached, briefly summarized in the Omnibus or Crop Estimates notes.

In connection with research, it would be very helpful in Iowa if, with the address, "Township" could be asked on all schedules. It would enable us to make comparisons with the assessors' enumeration for special surveys. Acreage comparisons with the assessors' are especially needed in years of crop failure to determine whether the assessors' enumerations and our surveys really have the same definition of harvested and planted acreage, and, if not, how much the difference.

It seems wise to me that we have Bureau men from outside the Division on this program. It is easy for some of us to get buried in our own points of view and methods. If such conferences are possible in the future, there might be considerable advantage in having on the program men outside the Bureau who use our data extensively, perhaps even some who are critical of our methods and results. For instance, might there not be an advantage in including men from commercial organizations and the colleges?

THE BUILDING UP AND MAINTENANCE OF ADEQUATE LISTS OF AIDS

Clarence O. Parker, Mississippi

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The basis for all of our forecasts is the information secured from our correspondents. Maintaining adequate and properly balanced lists of reporters, therefore, becomes a very important phase of our work.

Of course, the first step in compiling or increasing a list is to get names to circularize. This is a relatively easy task in view of the large numbers of names that can be had from returns from rural carrier surveys, county agents, requests for additional names to our present reporters, business directories, AAA contracts, etc.

The real need is a list that will adequately reflect conditions in each section of the state. This involves making studies of the number of reports required to give the desired stability to district averages, the proper distribution of reports within the district, the percentage return that can be expected, and then the keeping of accurate records of returns so that a proper balance can be maintained after it has been reached. Based on a study of the returns on the General Schedule in Mississippi, the following procedure, I feel, will improve the list and consequently the basis for our estimates. The same procedure, with different bases for distribution of reporters, might be used for other lists.

An arbitrary number of schedules to be tabulated was set at 750, and the number to be allotted to each county was then computed on the basis of the 1935 Census number of farms less the number of sharecroppers, since most of our reports come from large operators who report for the land farmed by their sharecroppers. The number of names required, by counties, was then set up on the basis of a 50 per cent return.

An analysis of the existing list was then made. This showed that the existing percentages of the numbers required ranged from 17 per cent to 186 per cent by counties, and from 41 per cent to 89 per cent by districts, with the average for the state as a whole 70 per cent. Five hundred additional names were needed to bring all counties to 100 per cent or more. Two hundred names actually have been added to the list, with the result that the county range is from 17 per cent to 200 per cent, the district range from 58 per cent to 129 per cent, and the state average is 85 per cent of the arbitrary goal. In other words, many of the 200 additions were in counties that did not require additional names, while some of the weaker counties received no additions. Had requests for new reporters been confined to the weaker counties, the names added would have materially reduced the range

between counties and some counties which were already over-weighted would not have been given additional weight. This emphasizes the importance of determining just which counties should first receive attention.

It is assumed that usually district weights will take care of the variation in size of sample between districts. The county averages, however, are not weighted to secure district averages, so the importance of proper distribution by counties within the district becomes apparent, especially in districts where local conditions vary greatly.

After the establishment of a well-balanced list, the problem of securing regular returns requires constant attention. A number of methods are being used for this, but definite proof by which to measure the effectiveness of any particular approach is lacking. A "news letter" to reporters, which is now used by most states, seems to stimulate reporters' interest. In one state with a relatively high percentage of return, the practice has been to mail some kind of report with each schedule. Sending of "reminders" with the next schedule to those who fail to report, either in the form of a simple slip or a short letter, has improved returns in a number of states, while in others apparently better results have been obtained by mailing the "reminders" a few days in advance of the next schedule.

There is often a tendency to "work a willing horse to death", that is, to add a reporter to too many lists when he reports consistently on one. While this may bring results for a time, ultimately the reporter will receive so many schedules that he will discontinue returning any of them. Only in cases where it is absolutely necessary should a name appear on more than one list.

Probably another reason for poor returns is that reporters sometimes do not receive a report on the results of the surveys. There is sometimes a tendency to eliminate reports that are of minor importance. I believe that a state release should be prepared for all inquiries because the report may be important to those who reply, even though it may not be of widespread general interest.

Of course, each type of inquiry brings up different problems. The "Ohio" method of rural carrier survey sampling, as outlined in C.E.M. #527, is an example of the improvement that can be made, and no doubt other states have been making similar efforts. I should like to suggest that the results of <u>all</u> such studies, and forms relating thereto, be sent to each field office at the time the study is made, so that all others may have the benefit of such research.

RECOMMENDATIONS FOR IMPROVING WORK OF THE DIVISION OF CROP AND LIVESTOCK ESTIMATES

Henry L. Rasor, Texas

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In casting around for suggestions for improvement, one is faced with the question of whether or not his suggestions, if put into practice, would bring about the desired results.

At the risk of submitting ideas that may be impracticable, I am going to present the following suggestions which I believe are at least worthy of consideration:

1. That the Division should have a corps of regional men in its service whose duties would require them to spend the greater portion of their time in the different field offices. The purpose would be the securing of a coordination of practices and techniques among the different offices and a better understanding between the field offices and the Washington office.

2. That the Washington office should give more careful consideration to assignments that are handed down to the field officers.

These two suggestions are so closely correlated that I feel they should be woven into the same discussion.

Since its personnel is scattered throughout the different states, with a very small unit in each state, the problem of the Division in maintaining perfect coordination is much more acute than if the individual offices were composed of larger units. The field man, with his relatively small group of subordinates, and with his limited number of contacts with other members of the Division, is literally shut off from the remainder of the staff. He is not in a position to learn from the experience of others, nor is he in position to convey to others that which he has learned. It is true that he makes one or two trips annually to Washington to serve on the Crop Reporting Board, but what little time he has for conferences must be taken to discuss briefly, with the Washington officials, a few of the urgent matters which have been giving him the most concern. If a critical condition arises in his office, he may be favored with a visit from the Washington office. These visits prove helpful, but they are too often made for one definite purpose.

If the Division had a corps of men detailed to visit the different field offices at frequent intervals, I believe these men could be extremely helpful to the service. By actually working with and advising the field men, the regional man should become thoroughly familiar with

the activities of each office in his region. With his own ingenuity and with the information that he receives from those with whom he works, he should be able to coordinate the activities of each office in his region to the benefit of all concerned. The regional men should, of course, exchange ideas with each other and with project leaders in Washington, having personal contacts as often as possible. They should also meet in a general session at Washington at least once every 3 months, at which time they should present a joint report to the Administrative Officer. This report should explain in detail the nature and volume of work being done in the field, and the ability of the officers to execute the program which has been outlined. The work of the regional men would be very useful to the control office in Washington where a constant check would be maintained on the demands by project leaders upon the field service.

Since he has made himself familiar with the activities of the field offices, the regional man will be able to give the Washington office a thorough knowledge of the type and volume of work being done in the different states. He will also be able to make suggestions for improving the general efficiency and morale of the entire organization. By being in position to explain to the field men the situations that make special assignments necessary, the regional man can go a long way toward improving the efficiency and morale of the employees in his region.

During times like these, when special assignments are coming thick and fast, the field man sometimes feels that he is being overburdened with a lot of unnecessary labor, and that by complying with the demands from the Washington office he is having to neglect work that he believes is far more important. I believe in most cases the special assignments given to the field are for work which supplies a genuine need. In spite of the merits or demerits of a program of work, however, there is a limit to the ability of anyone to turn out satisfactorily a volume of work. But the field man cannot say to Washington, "As I have all the work I can handle, I can't do this job you ask me to do." On the contrary, he must alter his schedule, which is already top-heavy, in order that he may get in his extra assignment. As a result, it is often necessary for him to submit important reports to Washington without having been able to give the necessary amount of consideration to them.

I have observed that the reports as released by our Division are generally regarded as authentic and only on rare occasions do we hear of anyone seriously questioning the accuracy of our estimates and forecasts. I feel that the prestige of our Division places us in an enviable position. In order that we might avoid the danger of losing this prestige, it is necessary that the accuracy of our reports be maintained. Therefore I feel that, in planning its program, the Division should give very serious consideration to the volume of work which will be required, and should be governed accordingly. The regional men could be of inestimable value to the Washington office in helping to determine the true situation in the field offices at any time.

THE USE OF DISTRICT RURAL CARRIER ACREAGE CHARTS

T. C. M. Robinson, Illinois

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For a good many years the Illinois office has been making county acreage estimates of the major crops without the benefit of an assessor's census. The first step in the construction of county acreage estimates of any crop is, of course, the setting of district acreages. In the past we have accomplished this by means of a work sheet on which we recorded district ratios to farm acres and calculated district ratio relatives of the current year to several different base years. These ratio relatives were multiplied by the district acreage estimates for the several years to give indicated acreages for the current year. By inspection of the several indicated current acreages, either in their raw state or after scaling to the state estimate, district acreages were set. Inasmuch as nine divisions and nine multiplications were required for each base year used, considerable work was involved, particularly since the sheet had to be set up all over again each year.

In an effort to save time, this past year district rural carrier acreage charts based on the three indications -- (1) ratio to land, (2) ratio relative, and (3) identical -- were constructed just as are state charts employing the same indications. It is apparent that for any district the acreage arrived at by multiplying the district acreage estimate for a given year by the ratio relative based on that year can be read from the ratio to land chart by merely making the current reading on a proportional line passing through the given year on the chart. Of course, a series of such readings based on several different previous years is not, in practice, made, but interpretation typical of all comparable base years is taken instead. The chart, which can be used year after year, gives a bird's-eye view of acreages in past years, and, when considered in connection with the two other charts, furnishes ample basis for the district estimate. Such district estimates can readily be scaled to total the state figure, with which they should be in excellent agreement anyway.

For five of our major crops -- corn, oats, soybeans, alfalfa hay and all tame hay -- the district charts were so excellent, in many cases equalling or surpassing the state charts in consistency, that the suggestion that district estimates be prepared from such charts and their total used in setting the state acreage estimate naturally arises. The excellence of the district charts is particularly gratifying when it is remembered that the estimates used in preparing the charts had been made without the help of this graphic method. It is my feeling that if sufficient reports are received from each district to make the resulting indications stable, we would do better to make our estimates on the basis of 27 chart readings, or 30 including the readings from the state

charts, rather than from a perusal of the 3 state charts alone. A greater refinement of our estimates might be made in the case of major crops which change very little in acreage, estimates being made to a tenth of a per cent change rather than to a full per cent change.

This idea of a built-up state estimate, just as our United States estimates are built up from state figures, may sound like a wild-eyed dream, which it may be, but this much we know: district rural carrier acreage charts are very useful in the preparation of district and county acreage estimates, saving much time and probably improving the quality of such estimates.

A CROP AND LIVESTOCK ESTIMATES HANDBOOK

H. A. Swedlund, Colorado

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When a young man first enters the service of the Crop and Livestock Estimates organization, he soon realizes he has much to learn. He immediately feels the need for basic information on fundamentals of the work. An organization established 100 years ago and doing the work this Division is doing has developed a technique that isn't acquired in a few days or months.

The meeting this week is giving a very fine opportunity to consider problems related to statistical procedure and administration. There are other phases of our work that can't be covered at this meeting that deserve our consideration. I refer to specific details of office method and efficiency technique; also to fundamental statistics that new personnel must know.

All of us are familiar with Miscellaneous Publication No. 171 called "The Crop and Livestock Reporting Service." This publication deals with the technique of Crop and Livestock Estimating. It also explains the work of the Crop Reporting Board. There are other bulletins of a technical nature that are very helpful in understanding and learning the statistical methods employed in our work. The suggestion I have is that it would be very helpful to the field offices of this Division to have "A Handbook of Office Methods and Efficiency Technique" prepared especially for the state offices of Crop and Livestock Estimates, and giving a written account of approved methods of carrying out our work.

With 40-some-odd separate offices throughout the United States, there is undoubtedly a great variety of methods used in carrying out certain fundamental duties. There are also varying degrees of excellence of performance in the execution of particular phases of the work in each office. The man in charge of a particular state office may have a greater interest in and understanding of some phases of the work and is able to lay greater stress on these points. While this is to be expected and is desirable insofar as it represents adjustments to meet particular state problems, it is rather obvious that certain offices have developed improved methods which should be made available to all the offices. By pooling the resources of all and picking up the best methods, the strong points of each individual office could be passed on to all the offices.

No effort will be made to mention all the subjects that might be covered in a handbook such as that suggested. A few specific items will be mentioned that should be included.

1. Outline of the duties of office management as applied to Crop Estimates work.

2. General duties of the Chief Clerk and other clerical help. Suggestions for handling this part of the work.

3. Mailing lists, and mailing duties of the clerk who handles this work. How to set up and handle a master file, and other files. Methods of handling survey cards to increase speed and efficiency.

4. Office files and filing procedure suggestions for improving Crop Estimates filing systems.

5. Tabulation and summarization.

6. Mailing room operation and efficiency. A trained operator can accomplish wonders in turning out mail in large volume and on time. There are certain methods used which, if properly analyzed, could be described and passed on to new operators. The efficiency of the new operators would be improved in a minimum of time providing the new person learned to do the job in the right way from the beginning, rather than by the trial-and-error method.

7. There are also phases of the technical work that are generally understood but which could be improved in some offices if the combined suggestions of the various offices were summarized in written form.

As one example, field interview technique as it relates to crop and livestock estimating work might well be covered. How to conduct an interview with a farmer or business man. How to make proper notes while on a field trip. How to relate the field trips to the sample data and use it in the report. There are many other phases of the work that could be included.

The important point of this discussion is that <u>if the combined experience of the various offices were summarized</u> on the essential details of doing the job, this information could be made readily available in written form and would be a real and valuable aid in training new personnel. Even though it would require some time to get this material together, it would always be immediately available when there is a change of personnel in the future.

The details of preparing a handbook of the type suggested would require considerable planning and study. A possible approach would be for each office to submit suggestions according to a definite outline prepared in advance. The suggestions could be reviewed in the Washington office and summarized for publication.

That concludes my remarks, except to say that this meeting certainly gives the younger men an opportunity to see the caliber of our organization. It offers us a real challenge as to the standards we are expected to maintain in carrying out our part of the Division's work in the future.

COOPERATION

T. J. Kuzelka, Montana

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When the word COOPERATION is mentioned among crop statisticians the first thought that is apt to occur is that of a cooperative agreement with some state agency, and the first question naturally is how much money they are putting up. This is not the type of cooperation that I choose to discuss. There is another type that adds just as much to the prestige of our work in the state and eventually brings to us a substantial reward. This type of cooperation seeks to extend the same spirit of voluntary cooperation on the part of all agencies dealing with agriculture as that which we ask from the producer himself in the matter of filling out crop reports. In both cases we must give something in return.

It frequently happens in our correspondence that requests are made by various groups for data which are not compiled in release form. Even though the work in the office may be pressing at the time these requests are made, we should consider wisely just how far we should go in supplying such information. To say the information is not available may mean the difference between making a friend or an enemy.

Frequently county estimates of particular crops are requested. Since the termination of the Federal-State cooperation in 1931, in Montana, county estimates have not been published except on a few occasions, and in the face of requests for such estimates it is up to us either to say the information is not available or to make an attempt to estimate for the territory designated. Quite often district data will serve as well as county estimates and are offered instead. The point is that we are offering something, or at least making an attempt.

Not many years ago the Weather Bureau, the State Extension Service and our office were each issuing a weekly crop condition report during the summer months. The result was that a considerable amount of duplication of effort and material occurred. At our suggestion to the Weather Bureau that their work could be more effective if a larger mailing list were used, the Bureau offered to combine their release material with ours. Prior to that time, the State Extension Service was approached with a similar suggestion and eventually the data of the three agencies were coordinated into one weekly report issued throughout the growing season. Proper acknowledgments were given in each instance, but since the report was issued through the office of the Agricultural Statistician, a goodly share of the credit came back to us. The price we pay for this good will

is the few hours spent in editing, typing the 3- to 4-page reports, and the paper involved.

Largely as a result of similar good will built up through the previous years, we have witnessed some of the fruits of such policy during the drought years of 1936 and 1937. During those trying years when the drought committees in Washington were requesting recommendations from us and the Extension Service of our state, it was often impossible to leave the regular work in order to survey secondary drought counties. Instructions requiring prompt action were received by wire. Our information sources had to be contacted immediately and it was not unusual for us to call for a report of existing conditions by telephone or wire from a list of key men in the afflicted areas, upon whose judgment we could rely by virtue of having previously contacted them personally and having faith in their judgment. The State Extension Service, through its county agent leader, seldom made a recommendation without first consulting us, and frequently we were asked to accompany their men on drought inspection trips.

The State Railroad Commission, during drought and other emergencies, is constantly confronted with requests for rate reductions. While the Commissioner made investigations of his own, he fell back on the Government reports for exhibits at the rate hearings. Through our contacts with him in this way we strengthen the bonds of cooperation and, in exchange, have persuaded the Commission to revise the commodity lists by the addition of turkeys, mustard seed, alfalfa seed, and the breakup of dried peas and beans. These data, showing carlot shipments by months, will be a valuable check source for the future, and are in keeping with our policy of developing more information on these commodities. A few years ago we were granted the privilege by the Commission of taking the original listing sheets, showing carlot movement of commodities by stations, into our office, where a special project was set up to take off county shipments for the series of years 1919 to 1934.

Through the State Grain Division we secure reports of wheat storage data by months, and at times the individual reports are lent to us for compilation or for the purpose of matching identicals in the event that our own monthly returns are incomplete. During 1936 when drought reduced the wheat crop to but 13,656,000 bushels in Montana, mill and elevator stocks were closely watched by the milling trade. Wheat for milling purposes was scarce, and exceptionally high premiums were offered for local wheat. It was important that during that year our survey should include the leading mill which was then holding over 50 per cent of the total wheat for the state in storage. In the event the report from this concern was late, there was always the possibility of obtaining the confidential report through the State Grain Division.

In addition to the agencies already mentioned, we might add to our list as cooperators the Livestock Sanitary Board, the Brand Inspection Office, the Cattle Growers Association, the Wool Growers

Association, the Billings Livestock Commission Company, the Sugar Beet and Canning Factories, the State Board of Equalization, and others. In fact, I do not know of any agency which refuses to furnish data on request and, needless to say, we are always glad to reciprocate whenever we can.

Such cooperation as the foregoing cannot be purchased by a price but is the end product of years of building of good will through proper treatment of the industries dealing with agricultural commodities. A statistician should be one man in the state who should not require a calling card when making his field trips. He should be regarded by the agricultural leaders and business interests in the state as a friend, and should have their confidence. It is for such a spirit of cooperation we in Montana are striving and, to a fair degree, have attained. We know it is a valuable asset in our work and recommend it for general use. One of my recommendations for improving our Crop Estimates work, therefore, is to make use of the opportunities for cooperation which are within the reach of every field statistician.

RECOMMENDATIONS FOR IMPROVING WORK OF THE DIVISION OF CROP AND LIVESTOCK ESTIMATES

John F. Marsh,

Arkansas

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We in the field offices are being pressed more and more for time because of constantly increasing duties. There has been such a mass of detail that we have had practically no time for research and study. With sufficient time for deliberation and study, many inconclusive charts, for example, might be made valuable by the inclusion of other factors.

If we are to have more time for study, we must utilize every possible means of saving time. The extension of the policy of having schedules prepared in Washington would be a great help to field offices. Also special survey listing and summary sheets would be time-saving.

The particular recommendation that I offer has reference to memoranda and instructions from Washington. Hours of deliberation and study by the Washington staff have gone into each of these Memoranda Instructions. These directions, numbering over 1100 since 1932, are our Bibles. Questions that arise about editing practice, method, or form, as well as concerning administrative matters, may be answered by recourse to one or more of these memoranda. The only difficulty is to find the right ones. The last instruction sheet on the subject is usually the most likely place, but it is almost impossible for any single set of instructions to be complete in all details. While most of these directions are prepared specifically for particular reports, it is necessary that comparability between surveys be maintained at all costs. Hence, it is necessary oftentimes to refer to a number of previous instructions in order to obtain information on some particular item. An example of this is Instruction #360, where we find: "Statisticians and all of their Assistants engaged in the preparation of prices received reports should review carefully F.A. 1377, C.E.M.'s Nos. 5, 7, 8, 12, 146, 272, 305, and 466 and Instructions 325."

Several solutions may be offered, among which is a complete catalog or index. I think it is preferable to retain all of the instructions as issued, rather than to re-write the old directions by subjects, for two reasons: first, because any effort to generalize would mean a great loss in illustrations; and, second, because of the immensity of the task. The indexing of all past C.E.M.'s, Instructions, and Specials would be a painstaking but not a difficult task. When we consider that practically every text or reference book is indexed, no matter of how little utility, no one can doubt the practicability of such a project. The only problem apparent to me is that new instructions are being issued currently; but this should not be a serious obstacle, since the field men keep recent instructions in mind as well as readily available. If all old instructions were catalogued or indexed, supplemental indexes could be prepared for each year thereafter.

THE USE OF SCHEDULES IN TRUCK CROP ESTIMATES

J. C. Townsend, Jr.
Associate Statistician, Florida

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In discussing the use of any schedule it will be well to bear in mind that the ultimate purpose is to obtain certain definite information. It is, therefore, necessary that we submit our inquiry in such a form that may be understood by the reporter -- a schedule that will "take his eye", so to speak -- and will make him think he can fill it out in a few minutes. With this point of simplicity in mind, we have tried to make our truck crop schedules as short and simple as possible.

We find that the addition of too many minor questions defeats the securing of replies on the main inquiry. Questions of a general nature can usually be answered by the state statistician as a matter of common knowledge. Under this heading would come questions dealing with container types, usual harvest periods, etc. Having once secured this information, it should not be necessary to repeat such questions. We do ask when harvest will start during the early part of the season before shipping has started and before our travel has commenced, but, having asked this question once or twice, we leave it off.

In truck crop work, the schedule is used mainly as a means of supplementing information gathered in the field through personal contacts. In Florida we do have one routine schedule to get information on Condition and Price as of the first and fifteenth of each month. The other schedules deal mainly with planting intentions. Yield indications are secured by personal letters or telegrams to key reporters.

The physical makeup of our schedule usually follows along the lines of the Washington inquiries. We hand them the usual wording of needing information for certain reports and usually promise them a report of some kind as a reward for replying. A pat on the back, occasionally, is not amiss. We have been stressing the importance of the "Remarks" in the space usually carried at the bottom of the sheet. We feel that these remarks are of great importance in getting a slant on the local situation. These notes are especially helpful in writing up crop news. We usually make some mention of the importance and value of the reporters' remarks, in the introductory paragraph.

Immediately following this introductory paragraph are four columns giving the list of crops, condition, price, and a fourth column for various uses, such as time of first shipments, shipments during a two week period, comments on damage from frost or rains, etc. Double spacing is used in order that the reporter may find the crops easily.

in the afternoon AFTER he has had a second look at his crops, and you will find his reports much more conservative and more definite in scope. He has had a chance to talk to other growers and probably has a good idea of sectional damage. If a second frost is forecast for the next night, we sometimes wait until next day to get the accumulated damage, although this usually brings a howl from Washington.

Along with all this collection of information by schedule, letter and telegraph, we try to visit the key reporters in Florida once a month if possible, but in the Carolinas, two trips a year are all that can be made. After all, personal contact is the most important source of truck crop information. Line up a good corps of well-informed growers or shippers, visit them often, and they will come through with schedules, letters and wires just when you need them most.

Other schedules on truck crops include Intention Reports in the early fall and spring, and certain special intentions on such crops as berries and watermelons. The fall and spring intentions schedules contain a long list of crops. We ask the acres harvested last year and the intentions for the coming season. These questions are asked for the section since most of the reporters are accustomed to reporting on a section or county basis. The strawberry inquiry in September included questions both for the section and for the individual farm.

As stated before, our main use of the routine schedule in Florida is securing the condition and price information for our truck crop condition reports published twice a month. Very few changes are ever made in the condition figures unless some crop damage occurs too late to have been included. The PRICES secured from these schedules are used as a check against other sources of information. We have two other main sources of price information: (1) daily reports of F.O.B. sales of produce as reported by the Market News stations in the state, (2) daily sales of produce in New York City market.

Daily records of F.O.B. reports are kept together with the daily carlot and truck shipments (where available). This movement is used to weight the daily prices. A selling charge is deducted and the result is a net price of a packed crate to the grower. This is the second price check for the fifteen day period, the first having been the average price reported on the schedule. The third check consists of the record of daily sales in New York City weighted by the truck and carlot unloads. From this average, selling charge and transportation are deducted, leaving an approximate net to grower.

Under normal conditions, the three prices are rather close. Sometimes, however, there may have been a sharp reaction in price that the growers' schedules failed to indicate, since the price reported by growers would cover only a part of the fifteen day period. In this case, the recommendations are in variance to the growers' reports. We feel that these three methods give a more accurate figure on prices than would be obtained by schedule alone. A seasonal price is calculated by taking the recommended price for the fifteen day periods and weighting by the shipments. Wherever possible seasonal average prices are secured from large shippers, for a further check against our figures.

The use of personal letters and telegrams is very important in securing truck crop information. Letters to key men are used when we have plenty of time, but we have found that a very large percentage of reporters will answer wires who would not reply to a letter. We usually try a letter first, and if that fails, we telegraph. When crop damage occurs, of course telegrams and telephone are used to secure quick information.

A point about securing reasonably accurate crop damage information is not to contact your grower or shipper too soon after damage has occurred. When there has been a frost in any territory, I never send out my wires until after noon. The shipper usually reports late

RECOMMENDATIONS FOR IMPROVING THE WORK OF THE DIVISION OF CROP AND LIVESTOCK ESTIMATES

Frank M. Taylor, Alabama

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My first recommendation concerns division of labor in field offices. With the diversity of projects we are now handling, no doubt every field office has had to divide the work and responsibility in some way. In my opinion, this should be done systematically and carried as far as the personnel set-up of the office will permit, with the division along vertical rather than horizontal lines -- that is, the members of the office staff should be assigned, more or less permanently, the responsibility for certain complete projects (under the general supervision of the head of the office, of course) rather than each man handling some phases of all projects. Only in this way can a fair amount of attention be given to each of the many reports we have to prepare, and by thus specializing will there be a chance to develop better technique and greater efficiency in handling each project.

There is just criticism of too much specialization, in that it tends to narrow a man and may restrict the possibilities of advancement only to openings of a similar nature, but specialty lines in a field office, while necessary for handling the work, should not be too jealously guarded. Peak periods for one project often occur when there is a breathing spell in others, and in the exchange of help at these times considerable familiarity with all of the work will necessarily be developed.

As to the systematic method of dividing responsibility for the various projects, consideration should be given to the aptitude and special training of the different men, and also care should be taken to avoid the assignment of overlapping projects, such as cotton and general crops, to cite an extreme case, to the same man.

A liaison man (my second recommendation) who would travel from office to office could assist in organizing a satisfactory division of work, in addition to spreading good ideas and making suggestions as to time-saving and uniform methods. Reports from the various states could thus be made more comparable, much lost motion averted, and personnel changes from state to state be made less upsetting.

As a third point, I suggest a regularly published news letter for the Division. A column by the "liaison man", which he would broadcast good ideas as he picks them up, could be a feature and, in addition to general announcements, instructions and explanations, many personal items would be interesting and would help to keep up the "esprit de corps" of the Division. This morning's issue of the Omnibus

is a glowing example of the possibilities of such a feature.

My fourth and last suggestion is about conferences. I think the benefits of these are so obviously great that some method of arranging them annually should be worked out. Since a nation-wide conference every year may be too much to hope for, I suggest that regional conferences be held in those years when national ones are impossible. With less travel and shorter programs, regional meetings would be much less expensive, but would still give the benefits of the exchange of ideas about most of our common problems.

I realize that these suggestions are neither original nor brilliant, but I do recommend them as steps towards greater smoothness and efficiency in the work of the Division.

APPLE ESTIMATES IN VIRGINIA AND IMPROVEMENT IN CHECK DATA

A. C. Hackendorf, Virginia

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Apples have become one of the most difficult cash crops on which to estimate production because we lack sufficient check data. Prior to 1930 a very large per cent of the commercial crop was shipped to market by railroad and therefore carlot shipment figures provided a very reliable check. Since 1930 there has been an increasingly large percentage of the crop shipped to market by motor truck until at the present time at least 50 per cent of the Virginia crop is shipped in this manner. This change in the method of transportation has left us without any adequate check on the commercial crop. Obviously the best solution, not taking cost into account, would be to have enough truck check stations to cover all important highways leading out of Virginia, so that an accurate check could be made on the truck movement. Reports from trucking companies would be of value but, due to the fact that considerable quantities of apples are hauled by the growers themselves or by small itinerant truckers, a complete report would be practically impossible to obtain. At present it looks as if it might be some time before either of these methods is seriously tried.

What can be done under present conditions? Since 1932 the Virginia office has been sending out questionnaires to growers regarding the quantity of apples shipped to market by rail and motor truck, as a part of the Disposition or Utilization schedule. We have not been altogether satisfied with the results and have made some changes in the questionnaire. In the past few years we have limited the questions on rail and truck movement to cover only that part of the crop that is sold direct by the grower for fresh consumption. This includes two items on the Disposition schedule: (1) packed fruit not put in cold storage, and (2) bulk sales to truckers, local merchants, roadside stands, etc. Many of the growers do not know how the fruit is shipped from cold storage, as the sale is usually handled by some selling agency. Therefore, we have asked the cold storages to report the per cent of the quantity that is shipped into and out of storage by railroad and motor truck. The same question is included in a questionnaire sent to the by-products plants. By combining these three reports, we believe we get a figure that is of some real value as a check on the commercial crop.

In 1937 we made a complete survey of the 3700 commercial orchards of the state through the use of W. P. A. help. In this survey we got reports from growers covering approximately 90 per cent of the total estimated production for 1936. These figures have been compiled by counties and commercial apple districts. This survey shows that approximately 60 per cent of the 1936 crop moved to market by motor

truck and only 40 per cent by rail. This same project is being carried over for the 1937 crop and we will have data, therefore, for both a small and a large crop year. This should furnish data that will form a good basis for future estimates. In the case of Virginia, it is important that the rail and truck movement be weighted by districts, as there is a large variation as to the per cent of the crop hauled to market by rail and by motor truck in the different parts of the state.

With practically a complete list of commercial growers as a basis to work from, we hope by the use of a mail schedule to get fairly reliable results in future years. A mail schedule is being used for the 1937 crop as a basis of comparison with the enumerated schedule.

Another check on the crop can be made against cold storage holdings. The Disposition schedule carries the item "Packed Fruit Put in Cold Storage." The per cent that this item is of the total sold for fresh consumption gives an estimate of the part of the commercial crop that goes to cold storage. Using the December 1 cold storage holdings as this per cent of the commercial crop, the total commercial crop can be estimated. The commercial orchard survey made of the 1936 crop showed 2,900,000 bushels reported going to cold storage while the Virginia cold storage holdings on December 1, 1936 showed a total of 2,600,000 bushels. Allowing for the fact that the December 1 figures fall a little below actual total holdings and that a considerable quantity of Virginia apples were stored in Washington, D. C., and smaller quantities at other out-of-state points, the figures seem to check fairly well. Reports from cold storages as to the total quantity stored and the quantity in storage from the various states would provide an additional check on this part of the crop.

Our checks on the non-commercial crop are based on the items of the Disposition schedule regarding quantities sold to by-products plants, used on the farm, and waste. This information is of value but lacks reliability, particularly in quantity consumed on the farm and waste. Our best check on the quantity used by by-products plants is obtained from reports received from these plants each year.

From the foregoing it will be seen that the part of the commercial crop that is moved to market by motor truck without being put in cold storage is the most difficult part of the crop on which to secure reliable check data, and, for the non-commercial crop, that part consumed on the farm and waste. Sufficient improvement in the former will make it possible again to make reliable commercial crop estimates.

AERIAL SURVEYS IN MISSOURI

J. W. Whittier,
Missouri

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Aerial surveying is too new as yet to have all the wrinkles ironed out, but it would seem to have real sampling possibilities for us in the future in various ways. Two counties in Missouri were photographed in 1935, and 48 more in the next 2 years, a total to date of 50 counties out of 114. Forty-two more counties are planned for this year, which will take in the entire northwest and everything south of the Missouri River, and it is planned to have all counties photographed within the next year or two.

In the fall of 1937 eight counties were completely surveyed. As this is the first time in this state that a complete survey has been made of any county, the first comparison is made with the 1935 Census land area. These 8 counties have approximately 3 million acres and include virtually all of the cotton grown in the state.

The land area covered in this group shows the aerial survey as 98 per cent of the Census land area. Shifts in boundaries, possibility of some error in the aerial survey, could have accounted for the difference for the group as a whole and for individual counties. Percentages of the Census run from 94 to 103 for the separate counties.

A comparison of land in farms and crop land shows a distinct increase in both over the 1934 Census. Farm land ranges from 106 to 125 per cent, and 121 per cent for the group -- 1,936,722 acres on the Census as compared with 2,339,878 in the aerial survey. The crop land comparison shows an increase for the group from 1,500,765 acres to 1,660,591 acres, an increase of 111 per cent, with the separate counties ranging from 86 per cent to 121 per cent.

The larger difference of land in farms over crop land is probably a difference in reporting land on the Census and aerial enumerations. Crop land should be comparable, including crops harvested, failure, idle, fallow, and plowable pasture on both surveys. Some incompleteness in the Census would be part of the increase of both crop land and farm land.

The possibility of increase in both farm land and crop land is greater in the southeast and south central regions than in the northern half of the state, so that these increases could hardly be representative of the state as a whole.

In the course of a few years, with every farm in this state and possibly other states covered by photographs, it would seem possible to

work out some form of cooperation with other governmental or state agencies for obtaining information on non-participating farms in at least a few counties or scattered townships to serve as a sample of farms not covered by the agricultural program. This should serve fairly accurately as a means of determining increases or decreases of farm land and crop land, and could possibly be used as a base for a formula to be used in adjusting for incompleteness of major crops. This is not necessary where complete coverage is obtained by a State Farm Census, but could serve as a Sample Farm Census in states not so fortunate.

SUGGESTIONS FOR IMPROVING CROP REPORTING SERVICE

John C. Mackey,

Texas

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I should like to see a program established whereby a closer relationship might eventually exist between the people engaged in farming and the Division of Crop and Livestock Estimates. This can be accomplished by arranging a personal contact with the youth of the country engaged in farming. Some of our offices have worked with Vocational Agricultural Schools of their states, but because this work was not centralized there was a distinct lack of coordination between the states. Those states not engaged in the work did not have the benefit of the results of the work that had been done, and some did not know of the activities in other states. A centralized office working for the benefit of all states should bring about better results. A uniform program could be set up and need for changes in the program would be realized sooner. Instead of a regular course in statistics as part of the school curriculum, I should like to see a lecture course offered.

Our field is not confined to the schools engaged in vocational agricultural work, which schools sponsor the Future Farmers of America chapters, but includes the 4-H Club activities in connection with the Extension Service work. In Texas there are 3,275 4-H Clubs and 525 Future Farmers of America chapters, with a combined membership of over 75,000. Contacts in the form of club work would be more effective than through schoolroom work. Our best results would come from good will rather than by offering something which requires work along lines still foreign to the conception of these young people. In Texas, each year there is a 2-weeks course at the Agricultural and Mechanical College for the benefit of the state 4-H Club activities. Contacts with these groups could easily be arranged.

Since the question of securing reports is as important as the mathematical approach to many of our problems, we should not overlook the fact that a better reporting service can eventually be established through these young people. Because of the annual turnover of membership, there is not much chance for information which would serve as statistical background, but much progress can be made in the way of future good will and understanding. Many of our reporters do not fully understand what they are answering and many others would serve us more regularly if they realized the importance and seriousness of our work. We could also outline the value of our information to them and the many uses made of the agricultural statistics in the economic structure of business in general.

There is no question that the youth engaged in these club activities will continue in some phase of agricultural work. If the message

of our work could be impressed upon the minds of a larger per cent of the 75,000 youths in Texas, surely some good would be realized for many years. It is a generally accepted idea that impressions formed before the age of fifteen are carried through life. We would not only have the help of these youths themselves to look forward to, but could expect them to pass their interest on to their parents, thus improving our reports both in number and in intelligence. As a means of reaching these young people, I think an interesting talk explaining the various approaches used in estimating crops would be helpful. Also a discussion of the procedure followed in releasing the United States cotton forecast would be most interesting to anyone, as would also an outline of the close relationship between the state offices to which these people report and the Washington office which releases the information they furnish. A brief demonstration of the use of charts would create interest. I happen to know of schools that have been eager for representatives of the Inspection Service to hold classes showing the students of vocational agricultural schools the various grade standards of fruits and vegetables. We also know of the various cattle and poultry grading schools. In my own work I have observed that my best reports come from areas where vocational agricultural schools are conducted. Some of my best reporters are men who make practical contributions to these schools.

The expense of this project would be offset by a larger per cent of returns. Our service would be better understood; those who enter more advanced colleges would be better equipped to use our material in their studies. Mutual benefit is possible to such an extent that an attempt to bring about this relationship, I should think, would be most advisable.

PROBLEMS OF LOCAL MARKET PRICES

R. F. Hale,
Statistician, In Charge Price Section

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Prices Received by Farmers:

Throughout the entire period since the World War the Bureau of Agricultural Economics has occupied a key position as a source of Statistical information needed by the administrators of the several programs for agricultural betterment. Today, the administrative requirements for adequate and reliable local market prices received and paid by farmers present us a challenge to so improve these estimates that they may be of the greatest service in our national economy.

Uses of Estimates of Prices Received:

The primary uses of the estimates of prices received are in the construction of price index numbers and in the computation of farm income. Some of the other uses are the computation of livestock-feed ratios; the determination of price-making factors; the appraisal of farm values for loan purposes; the establishment of flexible contracts for land rents; and the determination of flexible fees for grazing sheep and cattle in national parks.

Uses Require Comparability in Time and Space:

These uses have one characteristic in common - they demand comparability over a considerable period of time. In improving the accuracy of our current price estimates, the problem of adjusting historic series to a comparable basis should not be neglected. Changes in the price level are most frequently summarized with index numbers. The index numbers of local market prices of farm products extend over a period of 28 years, with the base in the 5-year period, August 1909-July 1914. The price series for individual commodities that are used in the construction of these indexes are also employed in the determination of cash farm income. Comparability is essential, if valid relationships are to be determined and reliable price fore-casts made in the outlook work of the Bureau. Comparability over time is of primary importance if our series of prices received by farmers are to be of value for other purposes.

Geographic or spatial comparability in our price series is of equal importance to comparability over time. The effects of many factors can be conveniently summarized only by a geographic picture of prices. This picture cannot be obtained in its proper perspective unless the data are comparable geographically.

An increasing demand has appeared in recent years for the breakdown of our State price estimates by price reporting districts. The smaller the area for which estimates are made, the greater the emphasis that must be put on geographic comparability if these estimates are to retain their significance.

Comparability, therefore, is the one factor that perhaps should be given foremost consideration in the estimation of local market prices. All series used in the computation of farm income or index number construction must be as comparable as possible for the entire period covered including the base period 1910-14. The fundamental objective is the measurement of change in prices over time and space. Any compromising of the principle of comparability can end in no result other than the weakening of affected series.

Estimates Should Approximate Actual Level of Prevailing Prices:

Regardless of the ability of reported series to show changes in prices received, it is the ultimate goal to approximate a price which, when multiplied by total sales, will give the total dollars received for agricultural marketings. A word of caution needs to be sounded, however, against too zealous attempts to approximate more nearly this actual level for individual commodities before the entire series is revised and made as comparable as possible. The principle of comparability can easily be vitiated if current prices are estimated on one basis where an unrevised historic series has been built up on another.

Field statisticians probably are often faced with local pressure to adjust prices where present quotations, as reported, are not altogether representative. This sort of criticism is most likely to appear where benefits may be at stake to be secured from crop adjustment, marketing agreement, and surplus buying programs. To overlook such bias would be a violation of the ethics of our profession. Prices should not be published that would permit biased long-time comparisons. This is stressed because the Price Section in Washington has not been free from the direct influence of pressure groups that have desired to sacrifice comparability to obtain larger Government payments.

Because of the importance of comparability in all statistical series, including prices, let us examine the term at some length and particularly its application to prices received by farmers. The exact meaning of the word comparability might be stated as similarity in regard to basis characteristics. What are the basis characteristics of ideal local-market price series?

Basic Characteristics of Prices-Received Series:

The time-honored definition of our series of prices received for farm products is the average price received by farmers when the product first changes ownership on the local market.

The local market: The term "local market" is not definable in a strict sense. Farmers buy and sell at the farm, in local trading areas, in nearby larger villages and cities, and in the more remote markets that are reached by railroads, trucks and boats. The trading area in which the farmer sells his product has been expanding during the last two decades and does not necessarily remain fixed even for one farmer.

Concept of gross price: Our definition of prices received would differentiate clearly between "net returns" and price. Price is the per-unit exchange value in terms of money at the time and place the product is sold. "Net returns", on the other hand, are usually thought of as that portion remaining after the expenses of marketing have been deducted from the price. At times other expenses, such as harvesting and hauling costs, are deducted in the determination of "net returns" and production expenses may mount to a point where there are no "net returns".

Composite nature of local-market prices: Average prices received by farmers, in addition to being gross prices, are composite prices. The paragraph at the top of each questionnaire requests the price reporter to quote a figure which, if multiplied by total sales, would give the total cash income received by farmers. An ideal average of the quotations returned by reporters in each State would represent an average of all sales in all parts of the State. This ideal average requires proportionate representation of all sub-divisions of the area from which the sample is drawn and such distribution for one item may not give a proportionate distribution for another.

State and national averages of prices now only approximate proportionate representation of all geographic subdivisions. The weighting system currently in use generally employs production rather than sales estimates as weighting factors, because data are not available currently for sales weights by districts.

Strict adherence to the definition of prices received by farmers also would require proportionate representation in the sample of all grades and qualities of a product going to market. Prices of each grade and quality of a product should be represented in the mid-month average in proportion to the relative volume of sales of each kind and grade.

There is a tendency, however, for a correspondent to report prices for the grade and quality of a product commonly quoted in his locality rather than the average of all classes and grades. The problem of securing adequate representation of all grades and classes in the respective price samples thus is still far from being solved.

The ideal average local-market-price series, furthermore, would require proportionate representation of all methods of sale. The bulk of sales of farm products are made in large quantities at wholesale prices. A variety of methods of sale are employed, however, particularly in the case of fruits. In some areas a considerable portion of the fruit crop is sold on the tree; in others, at the packing house

door; in still others packaged in boxes at the local shipping point; and in some cases at terminal auctions or overseas markets. Ideally, method of sale must be treated as another variable affecting the level of average prices and placed in the same category as supply, demand, distance to market, grade, quality, and other price-determining factors.

Obviously, the computation of an average having proportionate representation of all methods of sale is not easy. It requires a methodical approach to the problem and involves a rather full knowledge of each step in the marketing process through which the product passes on its way to the consumer.

The final requisite of the ideal "composite" local-market price average is <u>representation of all utilization blocks sold</u>. This requires representation of milk sold for cheese-making, condensing, and evaporating, as well as that sold for fluid consumption in the determination of an average price for all milk sold at wholesale prices. It requires representation of fruit sold for processing as well as fruit sold for fresh consumption. Where some utilization blocks appear only seasonally, as in the case of fruit for processing, the problem can be simplified by restricting monthly prices to the block most commonly sold and reserving the full utilization breakdown for the estimates of season averages.

It should be noted that the ideal average price figure would not include any block unsold, such as fruit used on the farm where grown. This problem does not concern the statistician in the determination of cash income. Evaluation of products used at average prices received for cash sales offers the simplest solution when calculating the total value of farm production. This is the procedure suggested for use by the Crop Reporting Board.

Conformity of Present Series to the Ideal Average:

The preceding discussion indicates that many of our present series do not conform to the ideal. Some should approximate the ideal because they are derived from reports on the total quantity of the product sold and the total money received. This approach appears to work fairly well in the collection of wholesale prices of milk.

The definition of average prices received by farmers allows free play to all the factors affecting the gross returns. It permits shifts in the price level as a result of changes in the production of farm products; in the ability of consumers to buy farm products; as a result of the contraction or expansion of surplus and deficit areas of production; as a result of changes in the average grade and quality of a product; shifts in the method of sale of farm products; shifts in the utilization of products grown; and fluctuations in any other local market price determining factor. The ideal average local market price is truly a composite measure of the effects of all price-determining factors.

The correct interpretation of such a series requires a recognition of its composite nature and a realization of the multifarious factors affecting prices. The estimation of such series requires an intimate knowledge of the local market for each agricultural product and the price-making forces operating therein.

Comparability of Present Series:

Most of our present series, though not conforming to these ideals, do not suffer materially from lack of comparability over time. They have been collected in a similar way throughout the past 30 years. There has been a rather general similarity in the editing of reported figures during this period. Regular submission of listing sheets to Washington in the past has aided materially in maintaining geographic comparability of editing practices since decentralization of the price-collecting work. Averages generally have been weighted and computed in a similar way for all major commodities.

Changes in Technique and Comparability:

Shifts in methods of price estimating must be made with extreme care to prevent loss of comparability in continuous series. Even slight changes in the wording of questions and instructions are sometimes sufficient to affect the comparability of the new with earlier data. The question regarding dry beans was formerly asked on a bushel basis, employing the same unit as that used in estimating yield and production. In 1926, the unit was changed to a hundredweight basis. This resulted in a complete geographic shift in the bulk of the returns from deficit to surplus areas of production. The shift altered in one month the level of dry bean prices reported in local markets, although no change occurred for many varieties in terminal-market quotations. An improvement in the accuracy of current indications was obtained at the expense of comparability with all earlier information. When index numbers, including this series, were constructed, rather arbitrary adjustments in the bushel series had to be made.

Several different methods may be followed in adjusting old series of prices to the new basis when questions are changed. The adjustment may be accomplished by the use of two questions for a particular item during the transition period, showing both the new and old questions on the same inquiry. Another and perhaps more desirable method necessitates the use of a split list and both the old and new questionnaires for a period long enough to approximate the relationship between the old and new series. Neither method is fool-proof, however, and the change must be made with the use of as many safeguards as possible.

Changes in the sources of information also may affect the comparability of the new data. A recent example has been supplied by the shift in the source of information used in the estimation of current wholesale prices of milk. Formerly these data were obtained from the regular list of general price reporters from which relatively few reports were secured. These usually lagged by a month or more

behind actual changes in average prices received. Wholesale prices of milk are now secured from a list of dealers that is even smaller than the number of general reporters replying to this question. But the new inquiry is arranged to obtain more nearly the information desired, and information is solicited from sources that are able to supply the most reliable data on average milk prices. Nevertheless, differences in the level of prices reported by these two lists were sufficiently large to necessitate the revision of 28 years of records to maintain comparability throughout the published series.

Strange as it may seem, an actual improvement in the representativeness of the sample also may mar the comparability of a price series unless steps are taken to revise historical data accordingly. The substitution of weighted for straight averages of State prices about a decade ago has disturbed the comparability of some price series now on the record. The acceptance of price averages, based solely on check data from commercial areas of production,would materially weaken the comparability and destroy the usefulness of most of our price series in cases where price estimates had formerly been made onthe basis of reports from the State as a whole.

Improvements in the representativeness with respect to the quality or method of sale or the various utilization blocks may ruin the comparability of a series and most certainly do not increase its usefulness for many purposes, unless the improvements are extended backward throughout the years. In fact, comparability is of such importance in price series that the revision of historical data might well be made a prerequisite to the release or use of improved estimates that would not be wholly comparable with earlier prices.

At the same time, all of us desire to make our estimates come as close to the actual facts as possible. No one is averse to making improvements and we all welcome constructive suggestions. The insistence upon comparability, therefore, should not be looked upon as a case against further improvement. Maintenance of comparability will require a great deal of work on the revision of historical series, and will doubtless delay the release of improved price statistics. It is essential that all of us should fully realize the responsibility of this Division in providing the administrators of all programs for agricultural betterment, and other users of these data, with price statistics that can be used for making valid and unbiased comparisons not only in time but also in space.

PROBLEMS OF LOCAL MARKET PRICES

B. U. Kienholz,
Statistician, North Dakota

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PRICES RECEIVED BY FARMERS

Mr. Hale has pointed out very clearly the growing importance of our farm price series. We have been made to realize more clearly the importance of maintaining comparability in the price series, not only as to time but as to space.

With comparability of primary importance, we still would be failing to fulfill our function completely if we did not make every effort to have our price estimates approximate the actual level of prevailing prices. In fact, in our opinion, this goal is very nearly of equal importance to comparability.

The price we need to approximate is the price which when multiplied by total sales will give the total dollars received for the portion of the product marketed.

Every year we receive some criticism of our potato prices, always to the effect that they are too high, and always coming from surplus areas. Based on market quotations at points in the principal producing areas, our prices do sometimes appear high and doubtless are too high. As pointed out by Mr. Hale, production weights are used. From 75 to 80 per cent of the crop is produced in 10 or 12 counties, whereas close to 98 per cent of the marketings come from these same counties. Therefore, to approximate market prices, we should use monthly quantities marketed by districts as weights. Such weights are not available at present, and, consequently, our potato price series will have to be continued on a level somewhat above the actual level.

Another problem developed in the fall of 1935 in connection with the price of wheat, oats, and barley. The 1935 crop was severely damaged by rust and heat, so that average weights were closer to 40 pounds than to a normal weight per bushel. A considerable quantity of the wheat sold fell into the sample grade. When this light weight wheat began coming on the market, it wasn't long before we began to hear from various sources that our published farm price did not at all represent the price of the average grade and quality sold. We began making inquiries and became convinced that the majority of reporters were not reporting average prices but rather the price of No. 1 dark northern wheat as recorded on the daily price cards which go out to buyers from the Minneapolis Grain Bulletin. The reason they were doing this was because the schedule asked for the price of wheat per bushel of 60 pounds. Since the light weight wheat only weighed 40 or 45 pounds, they felt they should not quote the prices actually received for it. It became necessary to

attempt an adjustment in the series to bring it closer to actual prices and yet maintain its comparability with earlier years. To do this we secured 15th-of-the-month card prices for as many points in each district as we could, for each of the months for which revisions were needed. We tabulated these card prices by districts, and by months, and weighted the averages secured in this way by the proportion of each grade of wheat received at the Minneapolis market as reported by the Federal Grain Inspection Service. This gave a new series of district prices for each month. The district prices by months were then weighted by the usual production weights to secure a state price for each month. From this series of prices, a revised series was adopted, more nearly in line with actual market prices and yet comparable to the earlier years. We concluded from this study that since the general practice appeared to be to report No. 1 card prices which did not exclude freight, our grain price series were probably on too high a level by the amount of freight to the Minneapolis market. Whether this is true of the earlier years of the series, we are not prepared to say, but, if so, it should be relatively simple to bring the series down to a lower level.

It is my belief that editing of the data should be held to a minimum. This is only in accord with the standard which has been set up, that the average price shall represent an average of each grade and quality of a product sold, and we know that for some products, especially livestock, there is an extremely wide price margin between the good and the poor grades, and it is these extreme prices which we are often inclined to edit out.

As a result of this price discussion, I believe we are likely to secure a more complete understanding of the difficulties involved in changing the methods of estimating current prices, and of the importance of avoiding making any changes which would tend to upset comparability unless it is possible to revise the historic series to the new basis. Undoubtedly there are price series in every State which can be brought nearer to the actual market prices and at the same time the historic series can be revised and its comparability maintained.

DISCUSSION OF MARKET PRICES RECEIVED BY FARMERS

Richard C. Ross
Idaho

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I shall try to do three things: (a) present a few examples of price estimating difficulties encountered in Idaho which I believe should also be fairly typical of problems in other states; (b) summarize a few of the grievances some of the field men hold against the Price Section; and then (c) present my suggestions of some things that could be done to improve our price estimates.

A. EXAMPLES OF PRICE ESTIMATING DIFFICULTIES IN IDAHO

The examples I quote all relate directly to Idaho, but I believe the fundamental theories involved will also apply to most other states.

(1) Potatoes: Up to about 1900 there was practically no commercial production of potatoes in Idaho. Up to about 1917, practically the entire commercial production was of the Rural variety. Grades and inspection were developed rapidly after about 1922 but as long as the Rural was the chief variety, only one grade (U.S. No. 1) was commonly used. Since about 1924 the Russet has become the most important variety and the Russet is sold under a number of different grades. Too, there have been changes in methods of sale. During the Rural period, most farmers sold their potatoes in sacks; more recently, sales of potatoes on a bulk basis have come to be the rule and now practically all quotations are based on a bulk price.

When Mr. Hale mentioned 13 different methods of sale of potatoes in one area at one time or another during a decade, he neglected to say that we failed to tell him about three or four other sale bases and that all these were utilized in a period of one month.

None of the changes in methods of sale happened suddenly, but each development resulted in some shifting of the price-determining factors. When it is discovered that the current series is not accurate, one wonders how it will be possible to construct a revised, comparable series under the philosophy of comparability followed by the Price Section. This is especially true since the check data now available and acceptable for indicating price trends cannot be obtained for all the years in the series, and if it were, would not be applicable to all years. It is not possible to adjust earlier estimates with current check data-price relationships because the Board estimates themselves lack comparability with themselves from month to month and from year to year.

Thus, unless we can unearth data to bridge the gap in the earlier years, we are in the position of perpetuating errors indefinitely if we follow the Board's philosophy instead of correcting known errors through

the years for which check data are available. At least, it would seem advisable, to us, to correct demonstrated errors in the month-to-month trends, even though the price level itself remains uncorrected.

(2) Beans: Our bean crop is groan primarily in two centralized areas. Around 90 per cent of the crop is grown in six irrigated counties in the southern part of the state (about half in one county) and about 8 per cent in a relatively small non-irrigated section of northern Idaho. In the main area, the principal varieties are Great Northerns, Small Reds, and garden varieties contracted for seed purposes. In the northern Idaho area the principal variety has been Small Whites, but in the last year or two there has been a tendency to shift to seed beans, Kidneys, and some other edible varieties.

All the commercial beans in the main section are inspected and sold on grade; the seed beans, of course, are sold on the basis of a contract price; both are sold on a cleaned basis. North-Idaho beans are usually sold by the farmer in dirt and without inspection.

It has long been noted that aids' indications did not adequately reflect monthly changes in price. We have attributed this to the following:

a. The schedule question asking for the average price of all dry edible beans does not and cannot elicit the proper replies. Production of each of the varieties is pretty well centralized and dealers usually make a specialty of handling one variety. Consequently, the dealer reports on the type and variety in which he is most interested.

b. Beans in the main section are sold almost entirely on grade, with U. S. No. 1 as the standard. Dealers and sellers, alike, therefore, have no interest in the proportions in the various grades, but think entirely in terms of the base grade. Therefore, practically all reported prices relate to the U. S. No. 1 price of the variety quoted.

c. Prices of the different varieties fluctuate widely and pretty much independently. Ordinarily, Great Northerns are our most valuable edible bean; this year Small Reds are materially higher than Great Northerns.

d. Because of these factors it is practically impossible to control the sample so as to obtain proper representation in number of reports, of quantities of the different varieties, or the various grades, and from the various geographical areas being sold each month.

e. The problem was further complicated last year by high price and the production of a large quantity of low quality beans which would not meet the standards of the lowest existing grades. A new grade was established to meet the situation but no price quotations were ever published on the new grade.

f. Prices of the contract seed beans are practically unavailable. The contracting companies do not publish or even furnish either total acreage or total production. Prices for individual varieties are sometimes quoted, but since yields vary widely between varieties, average prices are almost a complete secret. Even if the prices were known, there would still be the problem of determining when they should be applied, as payments are made over a relatively short period after delivery to the seed houses.

Our studies have not progressed far enough to determine how accurate is the level of the historic bean price series. However, since inspections by grade and by variety of 85 to 95 per cent of the commercial crop are available currently and since local market prices of the principal varieties are available, we feel that we have a very good basis for determining the month-to-month trend of prices.

(3) Alfalfa Seed: This is another crop for which our series of prices seems to be inadequate. At the present time, Idaho produces, probably, more certified Grimm seed than any other state in the country, but one has to go back only a few years to reach a period when certified seed production was negligible, and only a little farther to the time when there was little commercial production. Idaho seed, especially certified, also ordinarily commands a premium of several cents a pound over seed from the other major producing areas, even in home markets.

This is a commodity for which we obtain relatively few reports, due to the fact there are relatively few buyers and also because many of the buyers are of the type that cannot be reached by our monthly schedules. The Board, therefore, is likely to feel that our samples are small and inadequate even though the individual reports are submitted by the best-informed men in the business, and our small samples may, at times, include reports from firms buying as much as 50 per cent of the crop.

The estimating difficulties may be classified about as follows:

a. The Board insists that prices be based largely on dirt weight, though the schedule does not specify whether cleaned or dirt weight prices are desired. Idaho production, as nearly as we can determine from crop check comparisons, is estimated primarily on a cleaned weight basis. Thus, our prices must also be estimated on a cleaned weight basis if they are to be used for computing income estimates or indexes. Sales, of course, are made on both bases, but mostly on cleaned weights. This is one example of a commodity for which prices must be estimated on the same basis as production since there is no information available on proportionate quantities sold clean and in dirt and since these proportions vary widely from season to season and from month to month. For this reason, no assumption of these proportions can be accepted for general use.

b. The Board's habit of adjusting Idaho Prices to Board's prices for other states has often resulted in ludicrous estimates. For instance, about a year ago, there was a shortage of seed in Idaho and some quantities of seed from other areas were shipped in, chiefly, I believe, from Utah and Arizona. This out-of-state seed was retailing in Idaho at 4 to 6 cents per pound less than Idaho seed of comparable grades, but in several months when this situation prevailed, Board prices did not substantiate this spread. This was an unusual situation, in that Idaho's 1936 crop was nearly a failure, while Utah produced a fairly good crop. The usual relationships between Idaho and Utah prices, therefore, were upset, and it was not logical during this period to adjust trends in one state directly with trends in other states where conditions differed.

c. We also have the difficulty of obtaining separate schedule indications for Grimm and Common seed and of estimating the price of all alfalfa seed. We do not get reliable indications of Grimm and Common production until practically all of the season's crop is sold.

d. There is the difficulty of estimating alfalfa seed prices twelve months of the year, although, except for the seed handled and sold by a cooperative, practically all of the seed is usually sold within six months of harvest.

e. This is another price series in which the month-to-month and year-to-year price appears not to be comparable, being sometimes low and sometimes high. We can see no objection to correcting the current price levels when a condition such as this prevails, especially since it might prove to be impossible to obtain data with which to correct early estimates.

It must be admitted that the question of comparability arises immediately if it is true that production and price are estimated on different bases in Idaho and other states. On the other hand, we know of no way of revising Idaho production estimates from essentially a cleaned base to a dirt weight base, since check data are not available for more than a few years, and since the clean-out varies so widely, probably from 25 to as high as 75 per cent.

(4) Wool: I was especially interested in Mr. Hale's statement that "ideal average requires proportionate representation of all subdivisions of the area from which the sample is drawn." This brings to mind our difficulties in estimating wool prices.

I presume that nearly all the Western Range State Statisticians, who must estimate the price of over two-thirds of the national wool clip, experience about the same troubles as we do in Idaho.

By far the greatest amount of wool is sold to out-of-state buyers. Some of these come into the state during the buying season, but maintain no permanent offices in the state. Much of the wool is stored in Portland or Boston pending actual sale, and the sales are not made to agencies located within the state. This type of buyer is not represented on our mailing lists.

In fact, generally speaking, the only wool reports we receive from schedules are from the small buyers who buy in small lots from farm flock operators, for consolidation into lots large enough to interest the real wool buyers. They pay prices which do not fluctuate with market prices or with prices paid by the buyers mentioned previously who are not represented on our lists.

This is not a condition which can be remedied by list clerks, even in the offices which have them.

Insofar as we can see, it can be corrected only by the use of independent check data, some of which will be confidential in nature and not of the type which can be tabulated as a definite indication. A good example of this is the series of estimates we in the Range States prepared for Mr. Beier last year showing the numbers of fleeces sold and average prices by months. Our Idaho estimates were prepared largely by the Secretary of the Wool Growers Association who had personal knowledge of a large proportion of the transactions and who had, in addition, access to records of the banks and finance agencies which deal largely with sheepmen. The comparison is as follows:

COMPARATIVE WOOL PRICE DATA - IDAHO

Month	No.	Aids Str. ¢	Aids Wtd. ¢	Statist ¢	Board ¢	Wool Growers Fleeces (000)	Wool Growers Price Per Lb. ¢
1937							
January	7	32.0	31.9	32	32	200	35
February	9	33.9	33.9	32	33	75	34
March	12	32.8	32.9	32	32	250	35
April	18	33.9	34.0	34	34	200	35-3/4
May	14	34.0	34.1	34	34	10	31
June	13	31.0	30.7	31	31	20	32
July	5	32.4	32.7	32	31	20	32
August	2	28.0	29.7	31	30	5	30-1/2

It will be noted that the Statist's record is not clear or convincing, but his recommendations were influenced, in many instances, by the feeling that the indications would be followed anyway. Please note that the Aids and Board were low in each of the months in which sales of range wool were heavy; that they were high in May, the first month in which high priced offers were not made for range wool; and that the aids do pretty well when range wools are not selling.

We have no reason to believe that historic Board wool prices are more consistent or accurate than during this period, and believe it would be advisable to take steps to correct current estimates of this commodity even though it may not now be possible to obtain check data

with which to revise the entire series. Merely because the aids were inadequate in the past, and because no other reliable information may be available is no good reason for continuing an inadequate series.

(5) Hay: Nearly every irrigated section in the state produces more hay than can be fed to livestock on the farms where produced. This surplus hay usually is sold to range stockmen who bring their sheep into the irrigated valleys in the winter months and feed them on the farms where the hay is produced. Thus, the bulk of the hay sales are made directly between the farmer and the sheepman, with the purchase price covering not only hay but also such other services as stock water, corrals, lambing sheds, etc. Very little of our hay ever passes through the hands of hay dealers, and that is sold on a different basis and on a different price level than hay which is sold direct to stockmen.

Consequently, we have another example of our schedules not reaching the class of people who can furnish essential and accurate price data. A couple of years ago, people in the state very forcibly reminded me that we were estimating hay at $7.00 while probably over 90 per cent of the sales were made at about $5.00.

B. FIELD OFFICE GRIEVANCES

I hesitated a long time before I decided to present this part of my discussion and a doubly long time before I wrote the heading which appears over it. My hope is that a frank discussion of some of the points of rather general disagreement between the field and the Washington office will lead to a common understanding which will make us all feel better and result in a real improvement in this phase of our work.

The Board's policy with respect to accepting indications does not seem to be sound. This policy is based on the theory that if indications were accepted in past years and if there is no comment by the Statist to support deviations, the only way to achieve comparability is to accept the indications. It often appears to the Statist that the Board assumes the recommendation not to be even an independent indication, but feels free itself to deviate from both the indication and the Statist because of accepted trends in "other states," or other similar reasons.

For instance, there is relatively little milk retailed by the quart in Idaho, there being no areas of dense population. The price varies currently from 5 to 13 cents per quart. Samples are fairly large but there is a great deal of fluctuation in distribution of returns. If we happen to get a goodly number of 5-cent prices one month and 10-cent prices the next, it is obvious that the indicated trend is caused by a fluctuation in sample and is false. The only comparability achieved in accepting both indications is that of analysis. As an example, last October 26 aids indicated 8.9 cents; 27 aids indicated 9.2 cents in November. The Board took 9.0 in October and 9.2 in November. There were 15 identicals, indicating November was 98 per cent of October but only one of the 15 reported a change in price. As a result of following the indications of fluctuating samples, the Board prices remained high for three months, but are now back to the October level. From our

observation of identical reports and of prices in a few of the larger towns there have been no general price changes during the period.

Lack of logical reasoning used in justifying changes. For instance, consider the following:

a. "$.40 adopted, rounding down the average of straight and weighted and limiting decline since last month to a nickel." All this to justify a change of 1 cent.

b. "---Price, even in commercial area, higher than a month ago." The reported price was higher, due to sample fluctuations; actual prices were lower.
   I do not believe the reviewer had information to justify such a positive statement.

c. "Held up to November level in absence of comments. Dairy markets generally firm to higher." This applied to our retail milk, and the "fluctuations" comment had been submitted many, many times previously. Distant dairy market trends do not affect Idaho retail prices quickly.

d. "Sample inadequate -- price decline limited more in line with indications." If sample is inadequate, why insist on following it?

e. "Please send duplicate comments with price report. Yours were not received until the 28th." Our duplicate was airmailed with the comments, in defiance of previous instructions; the airmail material was stamped as received the 25th and the listing sheets themselves were stamped as received the 27th.

f. "Sample likely to be influenced by retail quotations at this time of year." At this time of year, practically the only farmer sales of this commodity are retail sales to other farmers.

g. "Adopted figure under alfalfa. Quality doubtless lower." This was grain hay, which is lower in quality than alfalfa, but which is grown and sold in a deficit section about 300 miles from the nearest commercial alfalfa producing area.

The price section sets up such minute and detailed instructions to field offices as to appear at times distinctly dictatorial but often without cooperating with the field in carrying out the instructions. For instance:

a. Instructions #360 stated definitely: "The mail transit time of each report should be checked carefully." Yet the date of receipt in Washington was stamped on only six of the 12 recommendation sheets sent in from Idaho last year.

b. Instructions #361 (on Prices Paid by Farmers) starts out with the underscored all caps admonition to "PLEASE READ THESE INSTRUCTIONS."

c. Editing of price sheets was reviewed by the price section for a long time after the tabulation was decentralized, yet listing sheets for the pre-decentralized period have never been sent to the field offices so that field men could compare samples, editing, and tabulating methods directly. These comparisons are essential when such projects as revision of entire price series are undertaken.

If the field man makes a conscientious effort to study price conditions in his state, it is logical to assume that he will be more familiar with the price determining factors and with current price trends than the Washington man can expect to be, yet the Price Reviewers do not hesitate to criticize the field analysis by adjusting recommendations on the basis of distant market trends or on the basis of trends in other states, when there are very good reasons why local trends do not coincide with trends in the distant markets, or in other states.

I believe that some of the Price Section's strongest arguments relating to comparability are ill-founded. There is no denying the need for comparability in the general level of price series. However, I can see no excuse for demanding the strictest comparability in acceptance of indications, method of analysis, and the like, in arriving at current estimates.

In other words, granted that comparability of the general level of a series is essential, our current problem is that of indicating current trends accurately. If the Idaho potato price series is generally high, as we suspect it may be, we still should make it our prime motive to reflect the current ups and downs of potato prices within the limits of the general level of historic price estimates.

If it can be proved that sample methods used in the past are not adequate to reflect these changes, we should not hesitate to adopt new methods of sampling or analysis if they will help us attain our objective of month-to-month and year-to-year comparability.

The Board's seeming reluctance to admit past mistakes often makes field men feel the Price Section feels it can make no mistakes. I know the Price Section makes no pretense of infallibility and I realize the difficulties involved in revising numerous indexes, etc., to correct for individual errors in particular states. However, when the Board gets off to a bad start on a commodity which may be sold over a comparatively short part of the year, and when the Board corrects its prices to the right level after the selling season is over without revising its errors in the important sales months, the field man is not likely to be satisfied that justice has been done.

C. SUGGESTIONS FOR IMPROVEMENT

We must first, of course, accept the philosophy of comparability over time and space as discussed so ably by Mr. Hale. This is essential. Thus, the Board must be responsible for defining and appraising the accuracy of the level of the price series and the comparability of the level of current prices with the level of historic prices. The board must also continue to be responsible for the definition of the basis upon which prices are to be estimated.

However, it seems to me that we must also accept the philosophy that current estimates must reflect accurately the current month-to-month trends, though on a level comparable with the historic series.

It should be the Statist's distinct responsibility to maintain this current comparability. If methods used in the past do not adequately reflect these current trends, they should be supplemented by other methods, or perhaps discarded. I am convinced that schedule surveys cannot be expected to indicate accurately the price trends of certain commodities, and believe we should be continually alert in searching for sources of additional indications.

From my own experience, I would suggest the following as possible methods of improving current comparability.

Improvement of schedules: There is much to be done with the schedules. Probably many questions should indicate the basis of the quotation desired, such as "all sales," "packed," "all grades," etc. Some questions need to be re-defined.

When these improvements are being considered, I would say it is most important that the field men be given a chance to review the corrected schedules before they are printed.

In this connection I was glad that Mr. Hale mentioned that "even slight changes in the wording of questions and in the instructions accompanying mailed inquiries are sometimes sufficient to affect the comparability of the new with earlier data." When the new schedules were prepared this winter the compositor wrote: "Oats, per bushel," instead of the usual "Oats, per bushel of 32 pounds." In Idaho, oats and barley usually sell for about the same price per hundred pounds, so that now with the weight of the barley bushel defined as 48 pounds and the oats bushel weight undefined, we find a large number of reports showing the same price per bushel for oats and barley. This is neither correct nor comparable.

Different sources of price reporters: When perhaps 90 per cent of a state's hay is sold directly by farmers to stockmen, I would say that the place to get information is from either the hay grower or the stockman. In this case, it might be advisable to ask these men only for hay prices, thus avoiding bias or distortion in other commodity indications. These sources would not be comparable with previous sources, but they could indicate current trends.

Use of News Letters to Price Reporters: The news letter, properly handled, is of distinct value in acquainting correspondents with the objectives of the surveys, the definitions of terms, and the uses to which the data are put. Most of us field men are not yet prepared to undertake new ventures of this kind, but it is well worth consideration in making future budgets and plans.

Identical Tabulations: These have proved particularly useful in indicating trends of commodities for which widely fluctuating samples are obtained, as I pointed out in my comment on retail milk prices in Idaho. My experience in presenting identical indications to the Board has not been productive, largely, I presume, because a continuous series of similar historic comparisons was not available. However, they can be extremely useful in indicating month-to-month trends.

Check Data: This subject can be made so far reaching and branch out in so many directions that I hesitate to open it up. The value of this type of data is that it is ordinarily independent of our usual sources, and that it either represents a summary of a large volume of sales or is a composite of opinions of a number of persons closely associated with the sales of an individual commodity. Check data are especially useful indicators for commercial, specialized commodities.

One must always be careful, though, that any series of data actually reflects price changes in the universe being sampled. A very large proportion of Idaho's butter, for instance, goes into Los Angeles, but current price changes in Los Angeles do not always accompany similar changes in Idaho prices of either butter or butterfat.

Market News reports are prolific sources of reliable check data, if properly handled. These reports usually quote prices on specified grades, so that they may not be entirely accurate unless it is possible to weight the prices by grades, by sales by grades. For example, about 90 per cent of Idaho potato shipments are sold under inspection. Thus, data on prices by grades and inspections by grades are available. Weighted indications from these data offer relatively accurate guides not only to price trends but to actual prices.

Newspaper quotations also offer many possibilities of check data on prices. There are several factors which must be considered in reviewing newspaper prices, such as definition of commodities, definition of areas to which quotations apply, and methods of weighting quotations from different sections of the universe.

Another matter of importance in using check data which relate to commercial area sales, is a proper method of weighting commercial and non-commercial area prices.

Revision of Historic Series: When tested by the theory of comparability over time as well as by the current day demands of actual accuracy I feel that very few of our price series would rate very high. At least, I feel this is true in Idaho. Widespread study of the need for revisions, therefore, would seem to be in order. That statement can be made very easily, but its attainment is not so easily realized.

This is a job that cannot be done wholly in the Washington office, since most of the check data and background material to be used in testing and revising are not available there. On the other hand, it is not a job which the field men can accomplish in their spare moments. It will necessitate slow, painstaking labor in searching out, recording and analyzing supplemental data.

I do not attempt to suggest ways or means, but I want to urge that something be done soon. A project such as this may call for additional personnel for a period; it certainly will call for additional funds to permit adequate field investigations.

Furthermore, it is a job which should not be delayed. Much of the currently useful data are hard to find next year, and may have disappeared entirely in five years.

Mr. Hale has emphasized the increasing importance of our price work. Our own experience, I believe, bears out his emphasis. It certainly is up to us now to demonstrate the adequacy of our prices or to take steps toward making needed corrections.

PRICES PAID BY FARMERS

A. R. Sabin,
Statistician, Price Section

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Objectives:

Our Division is charged with the responsibility of gathering data for computing the profit and loss statement of agriculture. In broad outline this profit and loss statement is the basis and inspiration of agricultural legislation and planning. At present our primary indication of changes in costs consists of prices paid by farmers. For this purpose price index numbers are constructed to give an indication of changes in cost of a fixed bill of goods, for use in calculating income parity. The increasing emphasis on income parity makes it unlikely that this demand will decline. Price data for individual commodities also are in great demand for purposes not covered by index numbers.

Retail Prices of the Bureau of Labor Statistics:

In the Bureau of Labor Statistics, as elsewhere, cost of production and cost of living have heretofore received scant attention compared with income items. The income of workers is covered rather fully, but their cost of living is measured only by price series and index numbers for fixed bills of goods. Prices are collected for a large variety of cost items in the budget of the industrial workers but actual averages are published only for food, gas, electricity and coal. Index numbers are prepared and published for allgroups and are recombined with some differences in weights to form a cost of living index which, in reality, is but a price index.

The bulk of the commodities priced (clothing, furniture, etc.) are collected in only 33 cities and from relatively small numbers of reporters. Average prices are not published for these items because of the small samples and the absence of funds for revising the series on a comparable basis. Relative prices are used in construction of index numbers and do not reflect changes in average prices that are caused by shifts in grade most commonly sold.

Retail Prices of the Bureau of Agricultural Economics:

Estimating prices paid by farmers is considerably more complicated than preparing the retail prices of the Bureau of Labor Statistics. The farmer purchases nearly all of the commodities purchased by the wage earner and also must buy a great variety of commodities

for use in production. Prices must be collected for both kinds of items and the numbers and kinds of commodities used by farmers differ considerably throughout the United States.

While the Bureau of Labor Statistics collects prices on 435 items of urban family living costs alone, we list only 249 items, including both living and production cost items. If we carry out our objectives, it seems apparent that some expansion will be necessary in the number of items priced, particularly with respect to the income parity work. On the other hand, if we had to confine our efforts only to providing broad indications of change in the form of index numbers a contraction might well be made in the number of items priced.

Retail Outlets Serving Farmers:

At present the data used are representative of prices at independent stores only. Our survey of stores patronized by farmers made in 1935 revealed that a considerable part of the farm trade was given to other types of retail outlet. Other major outlets were chain-store organizations, mail-order houses, and cooperative buying associations. Our problem is to first determine the outlines and relative importance of the different strata in the retail-price universe and then to devise means for getting adequate representation from each.

Stores Patronized by Farmers:

As a first step it is suggested that the survey of stores patronized by farmers be made at least once every two or three years. This will provide data regarding shifts in farmer buying habits and weights for combining data from the different strata, and will provide new names of prospective price reporters. We should also develop our price-estimating work for the types of retail outlet now being covered.

Mail Order:

Historical series of mail-order prices, f.o.b. Chicago, from 1910 to 1935 have been compiled. It is proposed to bring these series to date and to keep them current. As soon as our present data are placed on a current basis it is planned to extend the number of mail-order firms covered as well as the number of catalogs tabulated if sufficient help becomes available. We also plan to expand the number of items for which mail-order estimates are made and make current estimates of delivered prices on a State basis.

Chain stores:

Before we can determine what to do about chain-store prices we shall have to assemble and study the data. It appears probable that there are significant differences between prices charged by the larger chains and by the local independent stores for some commodities, but we do not know what commodities are involved or how large a chain has to be before significant differences appear.

Cooperative Buying Associations:

Cooperatives handle an appreciable portion of the business in a number of articles bought by farmers, such as farm equipment and auto supplies. Therefore, we must make adequate price estimates for commodities handled by these organizations, and keep abreast of developments in this and other types of retail outlets serving farmers.

Second-hand Goods and Auction Sales:

Still another stratum of the prices-paid universe is the trade in used commodities. For index numbers, this fact may not be so serious as when actual average prices are sought. On the other hand, fluctuations in farm purchasing power may cause shifts in the relative quantities of new and used commodities purchased; and price changes of used goods, particularly during periods of depression, may be relatively more or less than with new commodities so that movements of actual prices may vary from those of new commodity averages alone. When the Stores Patronized Survey was made in 1935 an appreciable number of farmers reported that they bought furniture at auction sales. Farm machinery is frequently traded in on new machines and , if usable, is resold. We do not have any indication of the volume of such sales. Progress toward solution of this problem might be made if special schedules are sent to regular dealers in used goods or to the regular lists.

Improvements in Present Service :

Thus far we have dealt largely with the part of the work in the Washington office. We now come to the problem of estimating independent-store prices in the field offices.

Analysis of Samples:

Before any intelligent attack on the problem can be made it is necessary to analyze our present samples to obtain indications of what needs to be done and how improvements can best be effected. It should be pointed out, however, that sample analysis per se does not bring a complete knowledge of the universe. Interpretation of results must necessarily be based on a broader knowledge of the universe than can be obtained from the sample alone.

Mailing Lists: Size of Sample, and Precision:

An increase in the number of reports received is urgently needed if we expect to attain our goal of accuracy for making State estimates. Closely associated with number of reports is the necessity for regularity in number. Wide fluctuations in the number of reports received from one date to another make it extremely difficult to maintain comparability or to approximate the actual price level. To obtain a large increase in the number received at any given time does not appear to be so difficult as to maintain a satisfactory level of returns.

In securing the names of firms to be circularized, statisticians have asked their crop reporters, taken names from telephone directories or business directories such as Dunn and Bradstreet, and gone to State universities or State tax commissions. In some cases reporters have been recruited from names secured on field trips. Advertisements in local newspapers may also furnish names of firms.

Maintaining lists, on the other hand, is a more difficult and complicated process but it is of great importance. In this connection, certain practices that have been used successfully in the Division for some time include: (1) list work to keep non-cooperators weeded out and to maintain lists of prospective reporters; (2) prompt and friendly replies to inquiries or requests from reporters; (3) systematic use of follow-ups and "missed your report" slips; (4) sending out useful and interesting reports and news letters to correspondents in return for their cooperation.

Other suggestions that have not been tried in our prices-paid work include: (1) sending out duplicate questionnaires so the reporter can keep a record of his report, and (2) supplying reporters with some appropriate insignia to indicate that they are price reporters.

Questionnaires:

Closely tied in with the list problem is the matter of questionnaires used. Questionnaires that are short and to the point are a great help in maintaining interest of reporters in that they are easier to fill out and take less time. It is believed that our present schedules could be sent out monthly and the commodities arranged in such a way that quarterly prices will be obtained for all items now priced. At the same time the schedules would be materially shortened. Recommendations to this effect are now being considered for 1939 schedules.

Any extensive revisions of schedules will also consider the advisability of constructing regional schedules in order to avoid burdening reporters all over the country with questions on commodities or specifications that are applicable only in limited areas. Suggestions from the field statisticians will be welcome in this regard.

Weighting and Identicals:

It appears likely that we shall never be able to secure an adequate number of schedules for some commodities and some states. This makes it more necessary to weight by districts in order to get a representative average. Some system of weights for price reporting districts should be devised and applied to prices paid by farmers as soon as we are able to do so. Arbitrary State weights must now be employed in the determination of United States price averages. These weights have been based on such general considerations as farm population for food and clothing weights, acres of land planted to different crops in the case of special machinery, number of farms, and other data. Reasonably accurate district weights probably could be arrived at on much the same basis as our present State weights but we would still have urgent need for quantities purchased in connection with the income parity, cost of living, and cost of production estimates required by agricultural legislation.

The use of identical comparisons should be expanded considerably in evaluation of small samples, particularly in the measurement of relative price changes. In retail-price work of the Bureau of Labor Statistics identicals are used exclusively.

Check Data:

One serious deficiency in our retail-price reporting system is the lack of current check data. Wholesale prices are of considerable value for this purpose, but unfortunately much of the available wholesale-price data are not obtainable in time for current use, have insufficient breakdown, or are based on points too far distant. To some extent this deficiency can be remedied by collecting wholesale prices from all sources now available. Regular price lists issued by large wholesalers, newspaper quotations, special catalogs of mail-order houses, and other sources provide more current check data if we are able to work them up.

Another important source of check data has been used to some extent, namely, the enumeration of prices in one store of each type in the town where the field office is located. Such enumeration in a nearby country town will also be valuable if it is possible to do this regularly. This practice also provides an excellent background of information regarding sales practices such as grades, weights, and units of sale, and should be adopted in all field offices.

Coordination:

At present the prices-paid work is decentralized but not adequately coordinated. The Washington staff are handicapped by lack of actual contact with field problems and frequently there is much truth in the charge that we are too academic. If the field men who are in Washington on crop reports could remain long enough to work on price reports also, we should make some progress toward more effective

coordination, even if this is practicable only a few times a year. Some such arrangement, together with additional travel on the part of the Washington staff, appears more necessary than ever now that listing sheets are no longer required to be sent in regularly. If more adequate coordination is not provided, we may soon have considerable divergence in methods, in which case comparability will be seriously threatened. Proposed increases in the volume and complexity of the work also increase the necessity for adequate coordination. In this, as in other phases of the work, recommendations of the field men will be welcome and will be given careful consideration.

PRICES PAID BY FARMERS

Frank O. Black,
Statistician, South Carolina

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The old formula for making a rabbit stew began with the admonition to first get your rabbit. Likewise, the first consideration of the field man is to get and maintain an adequate list of reporters, which has been our main difficulty in securing returns on prices farmers pay.

Various suggestions were followed for obtaining lists of merchants and all available sources have been pretty well exhausted, with only fair results. A further effort to build up the list was made in connection with our regular travel last summer when we personally contacted a number of prospective reporters. This method probably brought the best results of any one particular effort, but still our returns are not as full and complete as desired. The present efficiency of our lists is illustrated by the following table which shows the percentage of returns from the March 1938 inquiries.

Schedule	Principal Commodity	Number Mailed	Number Returned	Percent Returned
455-E	Feed, seed	127	54	42.5
455-AC	Clothing	105	46	43.8
455-AF	Food	200	92	46.0
455-B	Furniture	93	22	23.7
455-C	Bldg. Material	99	32	32.3
455-D	Supplies, etc.	100	35	35.0
455-G	Auto supplies	155	65	41.9
All groups		879	346	39.4

As will be noted, our best returns are on food and the poorest on furniture. Many of the furniture dealers contacted reported few or no sales to farmers.

It is felt that available mailing lists have been pretty well exploited and little improvement in returns can be had from this source. However, further personal contacts are planned in the course of travel this summer. We also contemplate personal contact of local merchants each quarter, but it is doubtful if this additional effort will bring returns up to the desired standard.

It seems we are confronted with the alternative of making out with about the present number of returns or devising some additional means of securing price quotations. The thought of employing representatives in certain key towns or counties has occurred but the cost

would probably be prohibitive for such a project alone. However, if and when a partial census can be undertaken, some arrangement should be made for enumerators to collect price information also.

Substitution of regional schedules for the present national schedule would be conducive to better returns. A number of items carried at present do not apply to the Southeast and others should be further clarified. For instance, fourteen items on the feed, seed and fertilizer schedule, as well as a few items on other schedules, do not apply to our section. Little or no fir lumber is sold in South Carolina and these questions could be eliminated. Also items 1 and 3 of the lumber schedule should specify whether dressed or rough; the latter is more applicable in my State. Furthermore, the No. 1 grade should be eliminated and Nos. 2 and 3 common substituted, since our farmers mostly buy the latter. In like manner certain items on the other schedules could be cited. It is realized that additional items can hardly be handled with present facilities but regionalization would permit dropping less pertinent items and adding those more applicable to each particular region.

PRICES FARMERS PAY

George Knutson,
Statistician, Wyoming

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At the outset let it be understood that any remarks made in this paper are not made in the spirit of antagonism. I feel it should be the province of each of us to avoid back-slapping but, rather, that we discuss the shortcomings of our work in the hope that such discussion will result in benefit to the service. In line with this idea, I have set forth certain reactions that I have had in this field of endeavor.

The schedules on prices farmers pay are the most difficult on which to get returns of any of the schedules sent from our office. Every effort to build up our mailing list has failed. We have secured the telephone directory of every town in the State and these have been scoured for names of mercantile establishments. Chambers of commerce and civic organizations have been asked for lists. The results have been negative in every case.

The cause for the indifference of the prospective reporters has been discussed in our office. We have arrived at possible causes, the first of which is the length of the schedule. The food and household commodity schedule has 39 separate commodities listed. Every store of consequence carries these commodities. In discussing this schedule with merchants they seem to feel that there are too many questions and, further, that there are no fixed brands that the farmer-buyer demands. Recently I was in one of the larger self-service stores in Cheyenne and took time to watch the buyers pick goods from the shelf. It appeared to me that neither taste nor occupation was the controlling factor. My observation led me to believe that buying power of the purchaser governed the brand of goods consumed. It may be that if this particular schedule could ask the question of medium priced goods, it would simplify the task of filling in the answers.

Second, there appears to be a feeling prevalent that there is too much duplicity of effort on the part of the Government and too much Government interference. Governmental schedules and visitations come daily, so the merchants say. This is very unfortunate for us, who are dependent upon the mails for our results. The natural thing for the reporter to do is to follow the course of least resistance, which leads too often to the waste paper basket or the sawdust box.

Third, the schedule pertaining to feed, seed and fertilizer calls for the price of corn and oats by the bushel. Space should be made to report also by the hundredweight. Our unit of measure for these commodities is 100 pounds. We should, I believe, avoid making it necessary for the reporter to have to resort to computations to

make a report.

Fourth, the farm equipment schedule is all right with the exception of the sizes of the units. No doubt the sizes given for some items are common in some States, but out our way, in the open country, some of these look like child's play to the merchants. Take, for instance, an 8-inch plow. This seems ridiculous to our merchants and tends to weaken the opinion of the reporter. The horse plow in most common use is not listed, namely, the 16-inch sulky plow.

It is possible to go through all of this group of schedules and find similar misfits for our area. I can readily see that to build a schedule that would fit all areas of the nation is near impossible. We are dealing with a set of schedules that has so much variation within the individual questions that it is indeed a very perplexing problem.

I should like to recommend that we have the schedules zoned as we do the crop schedules, so as to better fit the States concerned. It is further realized that this might tend to upset the index numbers of prices paid by farmers within the United States. On the other hand, this figure, as now reported, does not mean much to the fellow in Wyoming who purchases locally. It probably is a good barometer for the United States but it cannot measure the dollar's value in purchasing in Wyoming.

Then, too, there is the matter of comparability with adjoining States of the area. We hold that there is little comparability between this and adjoining States in factors governing prices paid or received in Wyoming because of the poor railroad transportation facilities within the State and the remoteness of some of our inland ranches and stores. A vast difference as to prices paid is also found as between dryland areas and those irrigated. This is largely because of the volume of business. Then, too, we have large stock ranches, which means a scattered population and high priced purchasing centers. Again, we have the dude ranch area in Jackson Hole country, which has entirely different price levels. The point I am trying to make is that the price for a given commodity in Colorado or Utah does not necessarily reflect the price in Wyoming.

One serious obstacle that should be remedied is that we do not get out releases of prices paid by farmers. I feel that we should give these reporters more information for their services.

THE CROP METER FOR DETERMINING CHANGES IN CROP ACREAGES

Henry M. Taylor,
Statistician, Virginia

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The crop meter has been used in some states for measuring changes in crop acreages since 1924.

The first meter only measured one side of the road, but about 1930 a meter was made which had two sets of keys so that both sides of the road could be measured. In many states the crop meter has given very reliable indications of a change in the major crops and in minor crops which are grown intensively in small areas. In Virginia we now depend largely upon the crop meter indications for estimating the acreage of such crops as early potatoes, sweet potatoes, tobacco, cotton, peanuts, tomatoes and certain truck crops, particularly spinach. We consider the crop meter our most reliable indication of change in total crop acreage, because we do not have the benefit of an annual farm acreage census, and we have difficulty in securing an adequate sample from the rural carrier acreage survey.

Our experience in using the meter since 1924 has taught us that it is absolutely necessary to observe certain rules in order to secure accurate results. The most important of these are:

1. The selection of routes. We have found that the main highways are not representative, and we now use the county roads almost entirely. We have also found it most desirable to include a large sample in the important counties, which is possible by carefully studying the county road maps. Once the roads have been selected they should not be changed unless it is absolutely necessary.

2. Uniform observance of rules concerning distance of fields from the highway, measurements in cuts, and along railroad tracks. It is also necessary to measure woods, waste and non-agricultural land in order that the total measurements may be checked with the road mileage, and with total measurements during previous years. We have found that frequently it is necessary to make adjustments in the measurements when a different car is used, or when there is a change in the tires.

3. Frequent readings of the meter. Records should be taken approximately every ten to twenty miles. We prefer the shorter distance, although more time is required to record the measurements, but with two people the record can be made in less than five minutes. If the readings are at greater distances, sometimes changes in the roads, washout of bridges, or new construction will make it necessary to detour, and under such circumstances we do not want to lose any more measurements than absolutely necessary.

4. The operator of the meter must give his undivided attention to observing the crops on the highway. When traveling at from 30 to 35 miles an hour it is necessary to look to the front and not to the side in order to have the finger on the proper key when a change from one crop to another should be made.

5. The time for making measurements can be arranged to secure the planted acreage or the harvested acreage. In our state it is necessary to take readings at different times of the year for the various crops. For instance, with spinach and strawberries we find April and October readings necessary, for early potatoes, May.

The principal advantages of the crop meter for estimating acreages are:

1. The results are available in a very short time.

2. Accurate indications of change from year to year.

3. The indications are not unduly influenced by the change in the number of farms.

4. Bias on the part of the reporters is eliminated.

5. The expense is much less than that of taking the acreage census, or of securing a large sample.

There are some disadvantages of the crop meter. The principal ones are:

1. The measurements are influenced to some extent by the operator. It is difficult, but not impossible, to have two different operators make similar measurements.

2. The poor condition of county roads and delays sometimes may prevent measurements at the proper time.

3. Two persons are required in using a double bank meter, one to drive and one to operate the meter.

The measurements can be used in two ways, either by direct comparison of identical roads or by comparing the ratios of each crop to total measurements. We have found the comparison of identical routes more satisfactory because of the great diversity of agricultural conditions and the difficulty in securing representative samples. In summarizing the results we always total each side of the road separately and compare with the previous year. When the indications are the same for both sides of the road we feel quite confident of their accuracy, but when there is a wide difference between the two sides we do not follow the indications so closely.

The crop meter, in our opinion, is a most valuable method of determining changes in crop acreage and we believe its use should be increased in all states which do not have an annual acreage census.

PROBLEMS CONNECTED WITH ACREAGE SURVEYS AND ESTIMATES

Glenn S. Ray,
Statistician, Ohio

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It is unnecessary to repeat a description of the method used in Ohio in obtaining sample data for our various acreage surveys. The method was developed by Mr. Tuttle and is fully described in C.E.M. #527, issued in August 1937. I think, however, it would be desirable to emphasize that the reason for our adopting the quota system is to secure adequate representation from each county in the state.

The quota system has been quite satisfactory but it requires constant attention to keep up the number of returns. Sometimes in addressing the envelopes to postmasters we find that Washington has missed a few post offices. Hence our first job, after receiving the addressed envelopes from Washington, is to check them against our list of post offices in the state. Another difficulty, and one which is becoming more serious all the time, is that occasioned by the consolidation of rural routes, and an increasing number of non-farm residents on rural routes. This necessitates sending a larger number of cards to each of the remaining carriers at the post offices concerned.

There seems also to be a gradual decrease in the interest shown by some rural carriers in the acreage and livestock surveys. Notwithstanding statements made by some of the Washington staff, it would seem to me highly desirable that this matter be discussed quite thoroughly with the Post Office Department in Washington. It has been many years since the cooperation of rural carriers was enlisted. I believe a courteous reminder from the Postmaster General's office to the postmasters and rural carriers would have a beneficial effect.

Returning for a moment to our method of handling the rural carrier acreage surveys, let me say that as each day's mail is opened, the cards are sorted by post offices and routes and the returns are credited to each rural route in a tally book. We next have comptometer operators add the acreages reported on each card, placing the total in blue pencil near the bottom of the card. I do not know how many offices are having such additions made, but if any of you are not, let me recommend it strongly. This step saves a great deal of time when actual editing of the cards commences.

After the comptometer operators have finished adding the reported acreages, the cards are placed in a cabinet containing a compartment for each county. The cards are grouped according to the counties in which the reporters state that their farms are located. If they have failed to indicate the county, we see if they reported their county in a previous survey. If this brings no result, the card is placed in the

county in which the post office is located.

With each survey a number of cards are returned which fail to show the farm acreage. A form letter asking for this farm acreage is sent out in all such cases. In the survey made in the fall of 1937 we salvaged 80 per cent of such cards.

Editing the acreage surveys is an interesting but somewhat laborious task, especially when the returns amount to several thousand cards. There are some improvements which could be made in the cards themselves which would greatly lessen the time spent in editing. I believe one of the chief improvements to be made is provision whereby the reporter can account for all of the acreage in his farm. The March intentions cards are especially faulty in this respect. Thanks to the goodness of a few reporters, they very kindly list pasture, wood-lots, other land, etc., even though uncalled for on the card, and when crop land is going into pasture one year, or vice versa, such a card requires little attention. When, however, there is what seems to be a marked increase or decrease in crop acreage with no questions on the card to help explain such shifts, the person who is editing the card is very undecided whether to use the card or to throw it out. Unless something looks radically wrong, we are inclined to accept a card even though the shifts in acreage are rather large. In the course of editing, we often compare a card with that from the same reporter in a previous survey and thus are able to salvage a considerable number of cards. This, of course, is done before the identical matchings are made and the chief objection to making this comparison with a previous survey is the immense amount of time required.

A difficulty encountered each year is in our estimate of all tame hay, largely because we do not have "annual legume hay" asked for on the rural carrier card. Although we secure a fairly satisfactory return to the soybean utilization inquiry, it does not seem large enough to give us a good indication for soybean hay. Perhaps cowpeas and lespedeza occasion the same difficulty in other states.

The item of "crop failure" often gives the field offices real concern and the acreage cards frequently are incorrectly answered for this item. Time after time reporters will show an acreage of potatoes, corn or oats as harvested and at the same time show an identical acreage of these crops as total failure. In two different years when this seemed especially serious, we sent special inquiries to such reporters and in many instances found that a crop reported as failure meant merely a low yield. The entire acreage planted had been harvested but the yield was quite low and the reporter stated his crop was a failure. True, the card, if carefully read, should not elicit such reports. Experience has shown, however, that the acreage card as now set up does not bring the desired results and we feel serious thought should be given to making such change in the card as will secure the correct reply.

When there has been actual crop failure, and reporters correctly list it as such, it seems desirable that we have some uniform method for

properly handling and estimating such acreage. Then, too, each year, even in the best, there is some crop failure reported. This brings up the question, "What is the normal loss of planted acreage?" In listing our acreage cards, at the right of the last column for acreage as shown on the cards, we use special columns for crop failure, listing therein the acreage of each crop designated as having failed. Since some reporters, however, will give an acreage for failure and not designate the crop, or, perhaps, will mention two or three crops as having failed but bulk the failure of all in one acreage figure, the acreages of failure reported as such always seem to be a very minimum indication of failure. We have wondered whether with a crop, say potatoes, we might secure better harvested data if the question on the card read, "Potatoes harvested or to be harvested" instead of just "Potatoes." Notwithstanding the fact that near the top of the rural carrier card there is a statement calling for the harvested acreage of each crop, the experience from working with these cards for several years shows that often a planted rather than a harvested acreage is obtained.

We realize that any change in a questionnaire from that of the previous year destroys the comparability of surveys to a certain extent. However, since the acreage questionnaires as set up at present are not bringing the desired results, some change seems necessary.

After the various acreage indications are worked up from our surveys, charts prepared, etc., we have the actual estimating problem confronting us. In states where check data of one sort or another are available, it has probably been found that some one or two types of indication are more reliable than others, one year with another. In a state like Ohio, however, where we have no assessors' data, practically no shipment data, and no crop meter measurements, considerable research will be necessary before we can say with assurance which type of indication is most reliable.

The use of charts has been a real improvement in our acreage estimating but it is believed more study should be given to the interpretation of charts. In this connection, I am wondering what can be done to secure more uniform reading of charts. Doubtless many of the differences existing between Statists' recommendations and the Board's adopted figures are due to different interpretations put upon the same charts by the various individuals handling them. For example, the Statist might read from a proportional line while the Board members could get a very different indication by using the line of best fit. Again, some might feel that earlier years should be largely ignored in reading charts while others consider early years just as important as the later ones. Also, how much importance should be given to a very unusual year, in chart reading? I believe the interpretation of charts offers a real opportunity for some intensive research.

This has been largely an enumeration of some of the improvements needed for better acreage estimates. Before closing, however, I wonder whether any study has been given to a better source of acreage data for July 1 than now obtained from our June acreage survey. With

our production estimates during the growing season based almost entirely upon this June survey, it seems to us that it should be far more extensive and complete. Many of the comments and criticisms made of the March intentions and rural carrier acreage questionnaires will apply as well to the June acreage survey.

DEVELOPMENT OF IMPROVED METHODS IN HANDLING THE KANSAS ANNUAL ASSESSORS ENUMERATION

H. L. Collins,
Statistician, Kansas

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In 1873 legislation was enacted authorizing the collection annually of agricultural statistics through the County Assessors. The annual enumerations have been taken without interruption since 1875 and have been administered during these years by the Kansas State Board of Agriculture.

The State Board was established in 1873 and has had a cooperative agreement with our Division since 1924. The enumeration is taken by the deputy county assessors beginning March 1 and is usually completed by June 1. It is taken at the same time property is assessed for taxation.

There were three rather distinct disadvantages to the wording of the schedule and the type of enumeration made in the past:

First: For the most part the enumeration has been an "intentions to plant" report and the acreages reported were subject to subsequent changes in conditions.

Second: Harvested acreage could not be secured with the schedule used.

Third: The schedule carried the following footnote: "Do not include land on which wheat failed, in columns for other crops," so that the acreage enumerated for corn excluded that planted on abandoned wheat land.

Shortly after the Sample Census Conference at Ames, Iowa, in July 1936, a survey was made of the schedules used and procedure followed in all states taking an annual assessors enumeration. After a rather thorough study of the entire situation the 1937 schedule was revised. The historic section was expanded to include the acreage of major crops harvested the previous year, and questions on 1936 acreage of crop failure, idle or fallow land and waste. Instead of instructing enumerators to exclude the acreage of spring crops planted on abandoned wheat land they were asked to "include the acres planted or to be planted on abandoned wheat land."

The assessors check-up schedule was also introduced and was mailed to about an eight per cent sample of all farms. The first column of this inquiry carries the acreage actually reported to the assessor and is filled out from the assessor's book before the schedule is mailed from the central office. A second column is provided for the correspondent to indicate the acreage of each crop

actually planted and a third column for the acreage harvested or intended for harvest. This survey is made in October and several years' experience with this type of inquiry in Colorado and two years' trial in Kansas leads me to believe that it is an excellent indication of change in intentions to acres actually planted. In addition, it also gives a second indication of abandonment to supplement that secured through the fall rural carrier survey.

Publication of County Data:

In the past the county acreages reported to Assessors, adjusted for acreage planted on abandoned wheat ground, were published and no attempt was made to have the published acreages check with the official estimates. The only exception was the harvested acreage of winter wheat. The published production figures have been in fair agreement with the official estimates. Under the present set-up the published county acreage and production data of all crops will total to the official state estimates. The State Board of Agriculture has agreed that in the future the assessors' data should not be published as such, but rather the assessors' material will be used only as a basis for establishing county estimates.

ACREAGE LEVELS

C. G. Carpenter,
Hay & Legume Statistician, Washington, D. C.

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The acreage objective has so many angles that there is danger of approaching it as the blind men did the elephant and with equally diverse conclusions.

In any state where one or two important cash crops predominate, the Statistician is expected to keep himself thoroughly posted on those crops -- and he does that. It is extremely important, however, to keep our total crop acreages in line, even though it may be necessary to do a little pulling and hauling on some of the items for which indications have a considerable range.

It is imperative that the swings in the total acreage of crops, and in the total farm acreage, be determined so far as possible. The percentage of total land actually used for farming varies considerably under different economic conditions. An upward or downward trend between two Census periods tends to be projected with some modification until the next Census enumeration is available. If we do not have some indication of the intercensal expansions and contractions in total farm land, the acreage indications for individual crops based upon ratios to farm land or ratios to crop land are likely to be considerably distorted.

In those states where good Assessors' enumerations are available there is not a great deal of danger of departing very far from the facts; but most Statisticians do not have such data. For many years Mr. Becker has hammered away at the idea that we should develop, if possible, other indices for changes in the capacity of the farm plant as a whole with particular reference to the acreages actually used for crops.

In the early 20's, considerable study was given to changes in the number of operated farms in school districts. This was not very successful as an index but did serve to point out some of the difficulties. About the same time, Mr. Church made some studies of the fluctuation in the school population in rural school areas in Michigan. Unfortunately, he discontinued this work at about the time when one of the largest swings for many years occurred. Judging from some scattered data, quite incomplete, his rural school population index would have substantially agreed with the changes shown by the Federal Census. Whether that approach would be useful in other states is, of course, an open question.

In Pennsylvania, Mr. Gasteiger has carried a question for some years concerning the occupied and unoccupied farm houses. Results

have not been spectacular because Pennsylvania Dutch are not spectacular, and the changes in that state appear to be small anyway. By the time another Federal Census is available, it should be possible to pretty well evaluate his approach.

Another approach which appeared to be rather promising was the number of mail boxes on rural routes. That may be satisfactory in some places but it falls down where most needed because there are a great many semi-suburban mail boxes which are not actually farm mail boxes.

In some of the Southern States, the crop meter has served to give a pretty fair indication of what might be termed the density of crop frontage and, therefore, of changes in total crops. Unfortunately, very few states appear to be making a sufficient meter mileage on country roads to get satisfactory results in this way. One of the really spectacular attacks was a sort of aerial bombardment of rice fields in Louisiana made by Uncle Charlie Gage some 10 years ago. He made the pictures, but we never did succeed in determining the acres of rice. Recent experiences by other organizations operating with modern equipment indicate that some crop acreages can be rather closely determined by aerial photographic maps if they are checked by field surveys, but for our purposes they are of most use as a point of departure.

These are some of the approaches which have been tried out in an attempt to keep our total crop acreage on an even keel. In these days of crop diversion and control, one of the fundamental considerations is the size of the farm plant as a going concern. Further development of data bearing on this question would be a most valuable contribution.

IMPROVED METHODS IN SAMPLING, EDITING AND ESTIMATING LIVESTOCK NUMBERS AND PRODUCTION

C. L. Harlan,
In Charge Livestock Section

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The general problems involved in making estimates of livestock numbers and production are quite similar to those met with in making estimates of crops. These problems have to do with the preparation of schedules to be used in obtaining sample data; distribution of these schedules to get the most representative sample; editing of the schedules returned; listing the acceptable schedules, and tabulation and summarization of these listings; and, finally, utilization of the organized data for making estimates.

Although the same general sampling problems are met with in making livestock estimates, there are material differences between the two that should be noted. To get indications of acreage of crops only a single universe has to be sampled, and the problem is to get dependable data that will show the distribution of that universe among different crops. The universe to be sampled changes little from year to year, since the total acreage in farms or in crops tends to be quite stable. Separation of this universe into different crops, however, may fluctuate materially from year to year but the total sets a limit within which these fluctuations must occur. With livestock, however, each species is a universe in itself, and there is no total which limits the changes that may take place. Hence, it is necessary to sample each species, separately, and indications of change in one species are of little significance in indicating changes in others.

When it comes to separating the total number of each species into significant age and sex classes the situation is fairly similar to that of separating the total acreage among different crops, because the changes that can take place in these classes are controlled by the total of the species. Thus the ratio relatives of classes to species correspond with the ratio relatives of crop acreage to total acreage, except that with livestock the ratios are of bases that may change considerably from year to year, while with crops the ratios are of a base that usually is fairly constant.

The principal indications of changes in numbers of livestock now being used are changes in the average number per farm, and the percentage changes in numbers on the same farms for the two years. If the portion of the universe that is sampled does not change greatly from year to year, averages per farm based upon adequate samples drawn from this portion over a series of years should represent fairly well changes in the universe itself. These averages, however, are particularly susceptible to distortion when there is material variation in the numbers per farm in different sections of the State, and the distribution of the sample varies considerably from year to year. The correction for this is

geographic weighting, and this should be applied to the average each year and not to the ratio relatives.

The other principal indication of change is that derived from numbers on identical farms. These numbers can be obtained either by matching current reports for two years -- the matched identical farm method -- or by getting reports for the two years in the current year -- the current to historic method.

Until about 10 years ago the individual farm return was a current-historic report and only schedules were used that reported for both years. The weakness of this method was that it involved memory bias and intentional bias, and that it failed to get "inners and outers". With such returns, of course, no comparisons of averages per farm were necessary.

This type of schedule, however, is still used in the Western States for January 1 numbers, and for special schedules like cattle and sheep on feed. The range in numbers per report in the Western States is so large that averages per farm tend to fluctuate widely from year to year and ratio-relative indications have little dependability. In order to get some measure of the memory, or other bias, in these current-historic reports, identicals are matched in the two-years. The variation between the current reports for the previous year and the historic reports made a year later, is computed and the current-historic percentage change can be corrected for this indicated bias.

In other States the percentage change from the previous year is based upon matched reports for the two years. These matched reports are tabulated by districts and the percentage changes by districts are shown. Weighting these district percentages probably does not tend to improve the State percentages, especially where the number of identical reports in some districts is small and the change shown is large. A comparison of district indications, however, is quite useful in appraising the returns. If numbers in all districts are either all up or all down, the indicated State change is much more dependable than if they are indiscriminately up and down, when there is no known reason to indicate why such variations might occur.

Recently there has been some very interesting work done on sampling and sample analysis by Mr. Been -- formerly in our Livestock Section -- who rates at the top of experts on sample analysis. As above stated, we have used the averages per farm and the identical farm indications very largely in arriving at our estimates of change from year to year. When these have been in fair agreement the interpretations of the indications are rather simple. Where they are considerably apart this interpretation is difficult. In general we have tended to follow the identicals, but with modification in the direction of the ratio-relatives. We have generally thought that the larger the proportion of identicals, the better was the return, and considerable efforts have been made in some States to enlarge the identical sample.

It is pointed out by Mr. Been, however, that the larger the proportion of identicals, the less valuable is the average per farm indi-

cation, as an independent indication, since a large part of its significance is already in the identical. From a strictly sampling standpoint, it might be better to tabulate separately the unmatched reports and to work up the ratios per farm from this independent sample. This would then give indications from samples that were unrelated as to origin. All of the variations between the identical and ratio-relative indications are caused by the unmatched returns. If these are separately shown and their wide departure from the identicals made more evident, a more careful inspection of the returns for distribution among different size groups and among counties in a district may be expected to result. In setting up State summary sheets for future use, it may be desirable to have the ratios and ratio-relatives of the unmatched returns either separately shown or substituted for those of the entire sample.

Having gathered our sample, the next step is to edit the schedules returned, either before or after listing. The pre-listing editing generally has to do with the completeness and accuracy of the answers to the various questions. Since most of these schedules now call for total numbers as well as classification, a basis for editing the classification is given. There still seems to be some duplication in the cattle classification reported which shows up in an added total larger than the reported total. This duplication is largely between heifers 1 to 2 years old and heifer calves. Several suggestions for changing the wording and arrangement of the cattle question have been submitted and these will be taken up at the livestock round-table session.

Editing and listing the December sheep reports on the rural carriers card have presented some difficulties because of the fact that many stock sheep farms also have sheep and lambs on feed and the separation of this feeder stock from the breeding flock cannot be satisfactorily done in many cases.

Editing the listing sheets has more to do with appraising the sample than with correcting the individual reports. On these sheets, the fluctuations show up plainly both in numbers and in percentage changes. Reports showing disproportionately large percentage changes and reports relatively large in themselves which distort the average per farm, can be eliminated or can be proportionately reduced. In counties and districts where there is a wide dispersion in the actual numbers, it may be desirable from year to year to keep a record of the number of reports included having over 4 times the average for the area. In this way the proportion of such reports in the total can be compared and adjustments can be made either by editing out or by reducing the average. Editing of listing sheets is one job that should not be delegated to clerks or to personnel not familiar with the livestock work.

Having the editing, listing, preliminary tabulation, re-editing of listing sheets, and final summarization completed, the next job is to appraise the results. Unfortunately, the time necessary for the work leading up to this usually leaves only limited time for such appraisal; still more unfortunately, time that is available is not always utilized for this purpose. We get far too many livestock reports which indicate that no great effort has been made by the responsible technical personnel to either analyze the returns or to adequately appraise the final results.

Various reasons might account for such inadequate appraisals. There seems little reason to enter this controversial field at this time, but it is worth while to consider some of the difficulties involved in trying to appraise these livestock data. Much of our judgment as to what different kinds of indications may mean is based upon records of how corresponding indications have been interpreted in the past. This judgment is usually made from some graphical representations showing the relationship of indications to estimates. These may be either time-series charts or dot charts.

In order that charts may be rightly interpreted, especially those of ratios to totals, some measure is needed of the accuracy of the totals. Because of differences between the 1930 and 1935 census enumerations there is considerable uncertainty as to how comparable our estimates are for these years. Hence, reading charts in the light of doubtful census year relationships may lead to wrong appraisals. In a good many States, where Census cattle numbers increased greatly between 1930 and 1935 these increases were much larger than shown by our original estimates. This happened because our sample data did not indicate such increases.

When revisions between 1930 and 1935 were made, the tendency was to follow the highest indications in any one year in order to get up to the 1935 census level. In some States the ratios per farm were higher and in others the identicals were higher. In these cases the dot charts show close relationship with one of the indications but very poor with the other. If the current indications are now read from these charts the tendency is to follow the one with the best fall of dots. There is considerable doubt whether we are justified in doing this. Theoretically there is little basis for assuming that over a period of years one indication is better than another, unless analysis of the various samples proves that this sample, because of its size, distribution, or some other characteristic, is consistently a superior sample. Unless such sample analysis can be made -- and there is little probability of this being done on any extensive scale in the near future -- we should be rather conservative in reading from dot charts, when it is known that the fall of the dots along a line of fit is a result of seeking to get from one census point to another by following such indications as best supported a very steep incline. And let us hope that when the 1940 census figures become available they will be comparable with the 1935 figures, so that we will feel confident that the changes shown represent the truth. When we have such "bench marks" we will have a better basis for appraising the indications of change for intervening years.

DEVELOPMENT OF IMPROVED METHODS IN SAMPLING, EDITING, AND ESTIMATING OF LIVESTOCK AND LIVESTOCK PRODUCTION

F. W. Beier, Jr.
Regional Livestock Statistician, Colorado

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The present system of livestock estimating has been greatly developed in recent years, and in general seems to cover the field very well. However, there is opportunity to make some minor adjustments in the wording of the schedules to better suit the needs of the various sections. The matter of editing the June and December Rural Carrier Survey cards has been covered in the instructions, but editing is evidently still dependent on local ideas and methods, which causes many variations.

Preparation of the final report should give full consideration to the sample indications, and also the various check data. There is considerable opportunity for improvement in the organization and proper analysis of the check data.

Sampling and Editing:

A satisfactory sample on a livestock schedule return is one that will properly represent the livestock situation. It is essential that the return be large enough to indicate the changes in the total numbers of each species, and have the proper proportions of the classes of each species. The distribution should properly represent all sections or districts of each state and in the case of large districts with a wide range of conditions, should be representative of the counties within the districts.

In some cases there is probably a tendency to do too much editing, but care should be taken to avoid the inclusion of reports from steer outfits, purebred herds, and feeders. No set rule can be established and the elimination of such schedules is dependent on a knowledge of the local situation.

Check Data:

All possible use should be made of check data to supplement the indications of the schedule returns. The proper use of such material would have materially aided in the January estimates during years of unusual shifts, such as the recent drought years. In some of the states where drought conditions during 1934 and 1936 resulted in heavy depletion of sheep and cattle, the sample returns failed to reflect the changes, which were more truly indicated by information regarding exports.

In recent years there has been considerable shift in the marketing of sheep and cattle, with increased direct movements due to drought conditions. This has resulted in the market receipts of livestock being of questionable value, and to secure any definite idea of exports and imports, it is necessary to depend on railroad records, inspections and other records of movements.

Final Preparation of a Livestock Report:

Lack of time for the final analysis and preparation of livestock reports, particularly the January estimates of numbers, has made the situation rather difficult in most field offices. This brings out the need for management and organization of the work to get results in a limited time. In an office where the material is well organized and handled it is possible to review and complete the January report in about one day; on the other hand, where the material is not well organized and recorded, it requires two or three days to do the job.

With the present system of records, it has been possible to greatly reduce the amount of work in the handling of the various livestock reports. It would seem that the completion of the additional record sheets, which are in the course of preparation and final approval, would be of material help.

The Fall Marketing Report from the 17 Western States has been a problem -- to forecast the volume of such movements with any degree of accuracy. Schedule returns from stockmen have failed to give satisfactory results, as have general schedules to bankers, dealers and others. An attempt has been made to analyze the various factors that influence the fall movement of cattle and sheep but time has not permitted sufficient study of the problem. It seems that if these reports are to be issued, more study and analysis should be made. The factors considered in the past and to be considered in the future are: inventory supplies of cattle and lambs, prices, demand, feed (range, etc.), finances, and just what the stockman will do in view of these circumstances. As set forth, there is much opportunity for improved methods and development in the fall marketing estimates.

There has been an increased demand for livestock information in recent years, particularly in the West. To meet this demand requires keeping in close touch with livestock matters and being able to give the industry a service that will meet the needs. This means more than quoting a few figures, but also being able to give statements of a general nature beyond the limits of schedule return indications. It also requires keeping in touch with the reports of the other agencies of the Bureau and Department, as most requests cover the entire field of livestock rather than the work of our Division.

TEXAS GOATS

F. E. Finley, Livestock Statistician, Texas

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While the sub-head for discussion calls for hogs, cattle and sheep, I would like to discuss, briefly, a more important class of livestock; more important to us, at least, due to our inability to create more interest in Washington on the Texas goat situation.

We have been wondering why it was so difficult to secure recognition for the lowly Texas goat and why our Division should discriminate against any species of livestock. From biblical times to the present the goat has been discriminated against, even though he is far superior in intelligence and mentality to any of the species of livestock for which we prepare estimates. In Texas, the goat not only furnishes meat which is far superior to lamb, but he also furnishes mohair for northern and eastern markets. If it were not for Texas goats, the Easter supply of lambs for eastern markets would be small, as the goat leads the lambs into the railroad cars and into the slaughter pens. The Texas goat has even been given the seat of honor in the Army-Navy football game and was permitted to lead the parade between halves.

At present there is no official "set-up" in Washington for estimating the number of goats on farms or ranches. However, in Texas we have been carrying on these estimates annually since 1924, with apparently fair results. If our estimates are in error, we can hardly blame anyone but ourselves, for we have not been molested by the Washington office. In carrying on these estimates, we maintain a list of several thousand goat raisers, but we use check data to verify all estimates on mohair production.

In Texas we have about 82 per cent of the United States Angora goat population and produce about 85 per cent of the annual United States mohair clip. The average value of this clip has ranged up to about $8,000,000 annually. This may not seem such a large industry but, according to the 1934 Census of Agriculture, there were only 18,740 farms reporting all goats (both sleek and Angora) and there would be a much smaller number of farms with only Angora goats. This makes it a large industry for the limited number of producers.

In an attempt to impress the Washington group with the actual importance of the goat industry to the State of Texas, I would like to make a few comparisons with the other species of livestock for which interest is relatively over-stimulated. During the past 5 years the average value of all goats on Texas ranches was placed at $5,626,000, while the value of mohair production alone has averaged $5,219,000, or

almost 100 per cent of the total investment in goats. During a 5-year period the value of cattle production has averaged only 32 per cent of the inventory, and for sheep, excluding wool, the value of production was only 20 per cent of inventory value. Including wool, the value of sheep production is increased to 61 per cent of inventory value. Other livestock, or agricultural commodities, may be just as profitable as goats, but when we consider that goats are almost a necessity in the "brushy" country to keep pastures clear of the heavy undergrowth, to permit grazing for sheep and cattle, the income from goats is almost a net income. Consequently, goat raising becomes the most profitable type of farming in the state and certainly warrants recognition by the Washington office.

Seriously speaking, we would like to be able to give the Texas goat raisers more current information on the goat situation in other states, in partial return for the splendid cooperation that we have had from them. At the present time our mohair report is released in March, which shows the production of mohair for the previous year. This report is usually mailed to the Texas producers several months after they have sold the entire clip, and after they have started on the current year's clip. Consequently, the information on mohair is of little, if any, current value to them.

The work involved in making mohair estimates along with the wool estimates, and kid crop estimates along with the lamb crop estimates, would not entail much additional labor in Texas with our present set-up. This may not be true in other states but we would like to have it considered. We would also like to have the Crop Reporting Board give consideration to having goats included as a part of the official January 1 livestock estimates.

I would like to give here a little ditty entitled "The Goat", written by one of our Goat reporters:

THE GOAT

A year ago
His mohair coat
Was of no use
Except to the goat.

The whole goat sold
For just two bits;
Not enough for
Two pints of "Schlitz".

His owner slipped
Into town at night,
To get his mail
Quite out of sight.

The New Deal brought
A financial dawn.
Hard times no more --
They are "going-gone".

Behold the goat!
He's up -- not down;
His mohair brings
Four bits a pound.

His owner rides
In motor cars;
Drinks "suds" from bottles
And not from jars.

The goat now eats
Alfalfa hay,
And not the cans
Of yesterday.

LIVESTOCK PROBLEMS

A. C. Brittain,
Statistician, Missouri

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There are certain things which we might do to shorten our time in securing livestock information. One of these is to reduce the classification items for both sheep and cattle. The reduction at this time appears to be less desirable for sheep, due to the unsatisfactory results obtained by the rural carrier surveys. I have in times past recommended that the cattle items be made to conform to the four classification items in the 1935 Census. The estimates of milk cows 2 would then have to be made from the information on "milk cows in the herd" and "cows milked."

This brings up the question of editing and editing instructions. There is a conflict of opinion as to the proper procedure -- those who want the minutest detail to the broad general instructions which have been issued on livestock since 1932. I am still firm in my belief that the latter is by far the best type and that the judgment of the statist should be depended upon to edit the returns in the same way each year, conforming to the few restrictions laid down by the Washington office. Generally speaking, I believe a schedule should be used as it comes from the reporter, or discarded. The one thing to avoid is to edit a schedule so that it conforms with a preconceived notion as to what the answer ought to be.

The question of securing satisfactory sheep indications has not been solved in the North Central States. One reason for the poor indications is the fact that more people go in and out of the sheep business than with any other livestock enterprise. One solution may be to use a special sheep list similar to that now used in the Western States.

Inventory numbers might also be added to the "sheep on feed" schedule. I was surprised that the large proportion of these schedules had more or less incomplete information on inventory items. It might be possible to work out a plan with County Agents to secure some measure of changes in farms growing sheep.

A point Mr. Harlan mentioned is that of tabulating the identicals separately. Since I have been in Missouri, I have examined the possibilities of this method by making this breakdown on a state basis for all hogs and horses for 8 years, and sheep for 5 years. The results for hogs would not affect the analysis of changes in numbers for any year. While they are somewhat inconclusive for horses and sheep, the separation throws a somewhat different light on the subject. I believe such a separation should be made for the advantage of editing

and appraising the returns, as well as a possible improvement in the indications. If the two separate indications are combined, it should be done on the basis of their probable errors. I recommend that this be done in the Washington office.

DAIRY ESTIMATES

R. L. Gillett,
Statistician, New York

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Let us define the field of dairy estimates:

Naturally, it begins with numbers of dairy cattle. This is in the field of livestock estimates but there are some refinements that should be made outside that general field. Milk production is next. Certain phases of this are important as giving general information, others must be refined and accurate. The utilization of milk begins to get over into the general field of commerce in milk and its products, and this is the field to which increasing attention must be given. The movement of milk and its products through the channels of trade is the phase that attracts most attention, and this field has been cultivated, in part at least, for a long time. Prices of the various products, at the various steps from producer to consumer, are a most important group of items that, in some aspects, have been highly developed, in others barely touched. Lastly, measurements of consumption are particularly important as measuring the general outlook for the industry and as indications of the extent to which dietary standards are improving or becoming impaired.

Each of these six groups is full of statistical problems demanding attention. There has been a rather hit-or-miss cultivation of parts of this field by numerous agencies but with little coordination of effort. The recent trend toward further coordination of the work in these various fields is gratifying.

It may be observed that we are thinking mainly in terms of regions where milk production is relatively important on a commercial scale. Other areas should not be neglected, but intensive development there is not necessary at present.

Numbers of dairy cattle:

(a) It seems probable that re-definitions of cow and heifer groups would clear up some of our heifer estimating problems. The present somewhat uncertain definition of "milk cows and heifers 2 years old or over" might be clarified by getting first: "Heifer calves under 1 year, being raised for milk cows"; and second, "Heifers 1 year old or over, but not yet fresh, to be kept for milk cows."

(b) In the regions where both dairy cattle and beef cattle are important, the division into "milk cows" and "all other cows" to be published regularly, would help to clarify the picture.

(c) More precise information is needed on the number of cows at different seasons. Several years of records from farms of crop reporters and dairy reporters have given some interesting though not conclusive results. We enter the number of milk cows on the record card when checking in the report. It is a short job to tabulate these cards for the period from December 1 to the second January 1 following. If at least eight reports for a farm are received during this period, well distributed as to time, it is a simple and relatively accurate process to interpolate the missing numbers with a red pencil on the listing sheets. In addition to the seasonal curve, one can obtain very readily from these sheets the December 1 and January 1 identicals which are helpful in the annual estimates.

(d) More accurate information is needed on the birth rate of calves, the turn-over of cows, the disposal of calves, and ages and breeds of cows.

(e) District and county estimates of dairy cows and heifers are especially helpful.

However, in our dairy cattle estimates, the most important single thing still needed is greater accuracy in the things we are now doing.

Milk Production:

Milk production is mentioned second because that seems the logical order. In states where milk is produced mainly for home use, a rough annual estimate meets present needs. In those states with important dairy interests, however, there are needed: monthly reports, preferably in quantitative terms, or at least expressed as a percentage of the corresponding month for the preceding year. In the New York office we have made such monthly estimates since 1934. Checked against complete dairy plant reports, these have proven relatively accurate.

Utilization:

The general field of utilization of milk has been explored for a long time. For the milk which is used on the farm or peddled locally, rough estimates will have to serve for many years. For that which is sold as butterfat or as whole milk, the task of relatively complete annual checks on a monthly basis would require only a little departure from the technique already in use by the Bureau of Agricultural Economics in its compilation of manufactured dairy products.

Movement:

The problem of movement to market requires collection of appropriate statistics in each step of the journey. These fall into a few well-defined classes, in which progress has been rather satisfactory, though there is still much to be done.

(a) Annual production figures for manufactured dairy products are already available over a period of years. Monthly data have been

published by states, also for 1936, and possibly are available for earlier years.

A possible improvement in this series is also to require the reporting of the receipts of milk and cream purchased from farmers, so that all the milk, cream or butterfat could be definitely checked as to intake and output of finished products. This would also increase our knowledge regarding the utilization of skimmilk and buttermilk.

(b) Storage stocks of butter, cheese, and cream are already reported monthly. It may be that further refinements are possible here, such as actual receipts at and shipments from storage, as a check on production. Weekly and daily storage movement reports are made for a limited number of markets for butter and cheese.

(c) Receipts at a few principal markets of butter, cheese, milk and cream are compiled daily, weekly, or monthly. The problems in this field are growing because of the increasing use of motor transportation and the gradual change in the marketing processes whereby deliveries clear through other than the older recognized market places.

It would seem that further coordination might be possible in respect to a number of these problems, especially in the collection of data from plants, through cooperation with the Census Bureau in its Censuses of Manufactures and of Distribution. Certainly this deserves study.

Prices:

In the field of prices of whole milk and dairy products, there is particular need for more information by states. Prices received by farmers for whole milk are particularly difficult to ascertain. In fluid milk territory these net prices to producers are not known until the middle of the month following delivery, which adds materially to the problem.

Consumption:

We are very frequently called upon for consumption data for dairy products. People want to know how much per capita or per year, not in generalized terms for the whole country but for a specific state or a specific product. In broad general outline, of course, national production (if determined accurately) adjusted for year-end stocks, losses and net imports or exports, will give an answer on a national basis, but this is not enough for local needs. A fuller development of data of this type would be useful.

In this discussion I have gone far beyond the confines of the Division of Crop and Livestock Estimates. It seems essential, however, that we have in mind a picture of the entire field in which we are working. As in a baseball team, our own function may be that of a single player, and it is up to us to strive for perfection in our playing. But no matter how good the individual, he will be still better if he knows a lot about the entire game, and if he helps the whole team to play a better game. The field of dairy estimates is big, and it needs skillful teamwork as well as good individual skill.

POULTRY AND EGG ESTIMATES

Dr. S. A. Jones,
In Charge of Poultry Section

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POULTRY INVENTORY NUMBERS

It is necessary to depend upon the Federal Census for the primary basis of our January 1 estimates of inventory numbers of chickens. The enumeration is probably reasonably accurate for holdings as of the date taken and for the farms enumerated, but comparability in successive censuses is disturbed by differences in the dates and completeness of the different enumerations.

Adjustments of the census figures to allow for disappearance between the theoretical and actual date of enumeration, are based upon changes shown by our samples during that interval. While this adjustment makes the census figures usable for January 1 inventory, it also incorporates some probable error due to lack of representativeness in our samples. The extent of such error is unknown.

The annual changes in inventory numbers indicated by our samples appear to have been about 5 per cent more for the 5 year period 1930-35 than census figures indicate for this 5 year period.

Comparisons of indications from the Livestock Disposition Survey and from the General Schedule indicate that these two lists represent different groups, with different reactions to economic stimulae.

Numbers of hens and pullets in the census years have been based heretofore mainly upon the relation shown between numbers of hens and pullets and numbers of all chickens, in our livestock disposition survey. Studies indicate that the relative proportion of hens, pullets, and other chickens varies with the size of the flock. The proportion of "other chickens" tends to diminish somewhat with increasing size of flock, and the proportion of pullets increases with size of flock up to a certain point.

To improve the basis for Annual Inventory Estimates items covering "pullets not of laying age" and "other chickens" have been added to the January General Schedule. These two items added to the item of "hens and pullets of laying age" give an inventory figure for all chickens. Another and probably more important step is now under discussion. This would be the inclusion of the items of "all pullets", "hens" and "other chickens" in the December rural carrier Livestock Survey. If this is done, it will supply about a threefold larger sample than we now get.

In making use of the rural carrier data it will be necessary to allow for marketings during December, but this would be a minor difficulty. After getting the new inquiry established, the poultry inquiries in the Livestock Disposition Survey could be dropped.

TOTAL EGG PRODUCTION

To determine total egg production, census data are much less satisfactory than they are for poultry inventory figures. We formerly assumed that a spring census enumeration might give reasonably well the actual production of eggs on the farms enumerated because they agreed fairly closely with the disappearance figures derived from the then available data on farm consumption. The census figures of 1930, therefore, were accepted as the basis of our annual estimates of eggs produced. Quarterly inquiries on farm consumption begun two years ago show a considerably greater farm consumption thanthe annual inquiries which heretofore have been the basis of our estimates. (Ed. Note: This might indicate that our present estimates of total egg production are somewhat too low for recent years).

ANNUAL CHANGES IN EGG PRODUCTION

The change in egg production based on our monthly reports of eggs produced per 100 hens have always been subject to some question. Average production of eggs per hen improves with increasing size of flock and our sample does not contain a proper size distribution of flocks. After weighting our returns by size of flock, however, we found that the straight averages of our present farm flock sample tend to agree closely with the weighted figures.

CHICKENS RAISED

In 1924 production of chickens raised was placed 8 per cent above the census figure, partly because of apparent census incompleteness and partly upon some evidence that a winter inquiry on this item would be too low. For 1929 the level was established upon the basis of the spring census returns of the year 1930. Recent studies suggest that the spring as well as the winter census figures may have been too low on the item of chickens raised.

The hatchery reports should be helpful as an indication of changes in numbers of chickens raised, but we have had no measure of the extent to which such changes in hatching sales might be offset by changes from year to year in the proportion of chickens hatched by farmers. This lack is now being corrected by two new inquiries. One of them, in the February General Schedule, asks numbers of baby chicks bought last year, and to be bought in the current year. The other, in the June Rural Carrier Card, asks numbers bought and hatched respectively to June 1, and also the number of young birds on hand and the number already sold and eaten. These questions will enable us to determine the proportion of chicks bought and thus permit us to utilize the hatchery reports.

Another development is the new quarterly inquiry on mortality in the laying flock. We know that mortality in commercial laying flocks has increased from about 15 per cent 10 years ago to 25 per cent or more in recent years. It has become necessary to secure a definite annual measure of this loss.

Our sample tends to show too few small flocks and too many large and very large flocks in comparison with the Census distribution by size groups. This was realized almost at the beginning of the poultry work and to meet the difficulty three principal alternatives were considered: (1) to weight by size groups; (2) to increase by some means the proportion of small flocks in our sample; or (3) to exclude from our sample all flocks above certain maximum limits.

Any system of weighting our monthly returns on the general schedule by size groups would involve many and confusing problems, much work, and delay in completing reports. Increasing the number of small flocks did not appear feasible. The third alternative was the one adopted. After reviewing the problem during the past year, and spending many months of study on it, the original plan of a sample with an upper size limit still appears most practical in meeting this particular problem. However, this limit should be determined more accurately, and when that is done it may be found advisable to fix different maximum size limits for the different States, varying with the average size of flocks in the State.

The seasonal group size limits might be based each month upon a suitable multiple of some form of average of all reports, rather than being a fixed figure for each month. This would allow the limit to vary with any general trend toward increase or decrease and so overcome to some extent the present difficulty of flocks shifting from one class to another during the season.

Still another possibility is to base all changes upon a comparison of identical flocks from month to month. This would involve keeping a monthly record of each individual reporter's figures of numbers of hens and pullets. The amount of work involved should not be prohibitive, as the number of layers could be recorded upon a monthly check list card in lieu of the check. This could be done as the reports arrive and the two months' comparison of numbers could be made direct from the cards, and, if desired, by group size limits. It would also permit comparisons for larger periods or for a year. This plan is not being proposed for general use but it might be useful in States where the sample is small and the average number of layers subject to extreme variations from month to month. It is planned to try it out in a few states this year. In some states, however, we are faced with the fact that no method can make something out of nothing. In these states we may need to establish special means for obtaining better figures.

SPECIAL COMMERCIAL REPORTS

The manner of utilizing the returns from this special report is still undetermined. The more we study the returns from the regular schedules, the more it appears likely that in a majority of the States we have in them the necessary basis for our estimates. The commercial group is too small in most States to have much influence upon State totals, and generally the returns from our commercial schedule have been too few to indicate what is taking place in that group. On the other hand, in most States, the reports in the farm flock returns for semi-commercial flocks of 200 to 400 are usually sufficient to indicate what is taking place in commercial flocks. In other States, especially those

of the Northeastern and Far Western group, the number of chickens in flocks of more than 400 layers forms such a large proportion of the total that it may be found advisable to utilize the special commercial list on these areas.

The greatest utility of the special commercial returns will probably be found in the wider range of information they supply regarding the operations of commercial producers, and in the fact that they are sufficiently numerous to give a reasonably accurate indication on these points for the United States and for principal regions. It will probably be possible to derive from them considerable information of interest to commercial producers, supplementing the data in our general returns. We have published none of this material yet, because returns from the special commercial inquiry for the first few months of last year were disturbed through changes in the schedule and in methods of handling the data. To utilize these returns currently, it will be necessary to devise some means of having them completed in the field offices earlier in the month.

POULTRY ESTIMATES

C. J. Borum,
Statistician, Oregon-Washington

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In the Portland office we prepare poultry estimates for two states, Washington and Oregon. In Washington the poultry industry is highly commercialized, while Oregon has a large percentage of "farm flocks."

Washington shipped 1600 carloads of eggs to other states, principally to New York, during the past year, and Oregon shipped 333 carloads. About one-half of the total egg production in Washington is accounted for in the carlot shipments, while in Oregon only about one-fourth of the production is shipped out of the state.

In Oregon the indications from the livestock disposition schedule and crop reports are reasonably satisfactory but in Washington the ratio indications from these inquiries have been unsatisfactory because of the highly specialized nature of the poultry industry in that state. The identical farm indication there appears to be fairly reliable except that it fails to register the effect of new farms established during the year. Ratios for "farm flocks" in a state where the industry is highly specialized may be considerably influenced by shifts in flocks from one size group to another, and ratios from all flocks are subject to rather violent fluctuations of sampling.

For Washington, we have recently developed an additional indication of change in the number of layers, based on net carlot shipments of eggs from November 1 to the following February 1.

The attached table shows for the winter quarter the total carlot shipments of eggs from Washington, the disappearance of shell eggs from cold storage, the derived net shipment of fresh eggs, the average rate of laying, the net fresh egg shipments adjusted for rate of laying, and indicated changes in numbers of layers. The indications for each year are shown as percentages of the base year (1930).

The indications in column 9 need to be further adjusted, because to accept them as they are is to assume that the consumption of eggs within the state fluctuates in the same direction and in the same proportion as does the shipments. Our final indication, column 10, assumes that local consumption is constant. (Editor's note: This assumption may not be valid but there is little evidence available to permit departing from it). Inasmuch as about one-half of the yearly production is shipped out of the state, the changes indicated in column 9 have been reduced by one-half. The cumulative figure for January 1935 is 84 per cent of 1930 compared with 90 per cent

originally estimated and 80 per cent after revision to the census indication. From this it would appear that it would be possible to make reasonable estimates of chicken numbers from the Bureau's market statistics after correcting them for changes in the rate of laying. However, we have not forgotten that our identical farms were our best single indication during 1930-35. We consider the new indication described above as our second best indication.

A new problem has arisen in estimating the number of chickens raised. Before 1933 we believed that the production of chickens was about evenly divided between males and females. That is no longer true on the Pacific Coast where chick sexing is quite a general practice. Many of the males are destroyed after sexing, although some are raised for fryers and broilers. This new factor of sexed chickens has disturbed past relationships, as it is very difficult to determine the proportion of males destroyed each year. The larger commercial hatcheries generally destroy nearly all of the cockerels from sexed chicks, while small hatcheries sell the cockerels for a small amount or give them away. It is quite possible that the hatchery reports are not comparable with earlier years.

There is a wide field for research and improvement in our poultry estimates, for which time and funds have been insufficient.

WASHINGTON

Egg Shipments as an Indication of Change in Chicken Numbers

	Carlot Shipments of Eggs (Nov. and Dec. of previous year plus Jan. of year indicated) (cars) Nov.	Dec.	Jan.	Total	Cold Storage Disap. Shell Eggs (Nov.1-Feb.1) (cars)	Net Shipment Fresh Eggs (cars)	*Index of Rate of Laying Pct. of 1930 %	Net Egg Shipments Adjusted for Rate of Laying (6 ÷ 7) (cars)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
1930	206	218	184	608	28	580	100	580
1931	216	285	292	793	42	751	105	715
1932	175	203	213	591	30	561	112	502
1933	166	200	169	535	36	499	103	484
1934	178	187	180	545	65	480	107	448
1935	158	167	132	457	45	412	104	396
1936	163	166	193	522	73	449	112	401
1937	191	205	166	562	47	515	119	430
1938	213	232	131	576	107	469	120	391

*Avg. for Nov. 1, Dec. 1, and Jan. 1

	Net Egg Shipments Adjusted as Pct. of 1930 % (9)	Indicated Number of Layers Pct. of 1930 % (10)**	NUMBER OF CHICKENS ON FARMS JANUARY 1: Bureau - Prelim. As. Pct. of 1930	Bureau - Prelim. Pct. Previous Year	Bureau Final Revision Pct. 1930	Statist. Original Est. Pct. 1930	Statist. Original Est. Pct. Previous Year
1930	-	-	-	-	-	-	-
1931	123	112	102	102	-	95	95
1932	86	93	98	96	-	90	95
1933	83	92	99	100	-	86	95
1934	77	88	98	100	-	83	96
1935	68	84	90	93	80	80	96
1936	69	85	-	-	83	83	104
1937	74	87	-	-	87	88	106
1938	67	84	-	-	78	78	89

**Change in Col. 9 reduced by 50% as only 50% of the production is shipped out of State.

FORECASTING AND ESTIMATING CROP YIELDS

V. H. Church,
Statistician, Michigan

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The determination of actual yields after the harvest should be far less difficult than forecasting those yields before harvest. Furthermore, little progress in the improvement of forecasting methods can be made unless accurate yield data become available for check purposes. Perhaps we have been guilty of assuming that our present yield data rate higher than other types of information collected. The remark has often been made that yield estimates are easier to obtain and more accurate than acreage estimates. This may be true where state or national estimates are concerned, but we have some recent contradictory evidence on that point in the case of county and district estimates.

When we were asked several weeks ago to prepare county estimates of the acreage, yield and production of potatoes for a period of five years, we noted a statement in the memorandum to the effect that county ratio-relatives from the rural carrier acreage surveys probably would be found sufficiently accurate for determining acreages. In examining the data for the first district in the first year of the series, we found the ratio-relative to the base year for one county was 3 per cent and for another, 900 per cent. Of course, the dispersion in the ratio-relatives just mentioned was an extreme case in one of the most difficult districts of the State, but we found many instances where even the district ratio-relatives could not be accepted. We were happy to find a solution of the county acreage problem in an entirely different and satisfactory manner. Then we took up what we thought to be the easier task of setting the county yields, and to our dismay found the problem far more serious than acreage.

The following tabulation (Table I) shows a comparison of the State and district potato yields, as reported in 1934, from the Census, November field aids, and the acreage and production schedule.

TABLE I

MICHIGAN POTATOES —1934
COMPARISON OF DISTRICT AVERAGE YIELDS AS REPORTED

Dist. No.	Acreage Wts. 1934 Census	Census		Nov. Field Aids			Acreage&Production		
		No. Farms	Yield	No.Rep.	Yield	Error	No.Rep.	Yield	Error
1.	7.5	14,247	111	36	150	39	80	165	54
2.	12.6	10,557	111	46	132	21	108	129	18
3.	6.8	7,214	116	17	121	5	43	138	22
4.	5.0	7,622	123	24	147	24	76	147	24
5.	15.2	15,981	125	51	133	8	68	124	- 1
6.	9.8	20,890	125	46	161	36	83	153	28
7.	11.6	24,297	108	90	127	19	173	140	32
8.	10.9	28,279	93	103	124	31	234	121	28
9.	20.6	29,915	105	107	123	18	186	131	26
State	100.0	159,002	112.1	520	131.9 wt.132.3	20	1051	135.7 wt.134.8	23

Assuming the Census to be correct, the State average of 520 field aids' reports was 20 bushels too high, and of 1051 acreage and production reports was 23 bushels too high. The charts in use at the time led to the adoption of a figure 16 bushels too high. The district averages from the field aids' opinion reports ranged from 5 bushels too high to 39 bushels too high; from the acreage and production reports, they ranged from 1 bushel too low to 54 bushels too high. Certainly, a range of 55 bushels per acre in the errors in district yields from a sample of over a thousand reports is food for serious thought.

Now let us inspect some county data within a district. We realize that districts with a large proportion of wild land and scattered settlements of farmers are apt to show erratic averages. For that reason, we have selected a district more nearly representative of the State as a whole; a district with one-eighth of the State's total potato acreage and one in which each of its ten counties rates potatoes as its leading cash field crop. The November aids' reports gave a yield for this District 21 bushels higher than the Census, and the acreage and production reports a yield 18 bushels higher than the Census. Such a result was to be expected because of the inherent selectivity involved in most of our series of reports, and the error of 18 bushels in the Acreage & Production average was the least of any district in the State except one. Had the errors in other districts been of comparable magnitude and in the same direction, the correction for selectivity would have been a simple matter but, as we have already shown, the errors were far from consistent between districts.

Now, having selected an important potato district with a difference of only three bushels between the averages of the two sample inquiries but selective to the extent of 16 and 19 per cent overstatement, let us examine the county figures for that district as presented in the following table:

TABLE II

MICHIGAN POTATOES—1934

Comparison of County Yields in District 2 from 108 Acreage and Production Reports and U. S. Census (Census figures in parentheses)

Bu. per Farm Report	Dist.	Antrim	Benzie	Charlevoix	Emmet	Grand Traverse	Kalkaska	Leelanau	Manistee	Missaukee	Wexford
-20	--(19)	--(35)	--(28)	--(36)	--(33)	--(23)	--(6)	--(21)	--(14)	--(22)	--(12)
20- 39	40(33)	--(45)	--(38)	--(54)	40(34)	--(37)	--(37)	--(33)	40(26)	--(24)	--(26)
40- 59	65(45)	67(62)	--(57)	--(59)	--(57)	60(39)	--(41)	--(40)	69(41)	--(33)	--(31)
60- 79	65(55)	--(74)	60(69)	--(71)	--(67)	--(48)	--(43)	--(49)	70(46)	--(43)	--(46)
80- 99	41(57)	--(75)	85(66)	--(79)	--(77)	21(49)	--(41)	--(45)	--(52)	--(44)	--(41
100-199	123(66)	193(87)	195(85)	107(77)	89(79)	--(50)	100(61)	--(52)	114(61)	--(55)	112(56)
200-499	88(87)	46(98)	--(104)	199(98)	115(106)	70(72)	133(86)	84(73)	158(93)	79(83)	116(82)
500-999	129(113)	125(130)	--(130)	232(123)	200(121)	102(100)	62(107)	114(108)	--(131)	150(113)	144(116)
1000 +	156(148)	174(152)	--(173)	173(168)	--(197)	114(135)	128(135)	178(142)	114(153)	164(148)	167(143)
ALL	129(111)	139(131)	124(90)	171(110)	130(133)	97(104)	115(112)	139(104)	123(85)	126(117)	137(97)
Error	+ 18	+ 8	+ 34	+ 61	- 3	- 7	+ 3	+ 35	+ 38	+ 9	+ 40
From 46 Nov. F. A. Reports	132	142	125	157	151	80	125	142	129	135	124
Error	+ 21	+ 11	+ 35	+ 47	+ 18	- 24	+ 13	+ 38	+ 44	+ 18	+ 27

Errors in the county averages obtained from the Field Aid opinion inquiry ranged from a minus 24 bushels to a plus 47 bushels, or an extreme range of errors between counties of 71 bushels. The Acreage & Production inquiry gave county averages with errors ranging from minus 7 bushels to plus 61 bushels, or a range of 68 bushels between counties in their average errors, and this in the leading commercial potato district of the State.

A tabulation of the Acreage & Production reports in the form of a frequency distribution, comparable with the one supplied by the Census Bureau and weighted by the group acreages, reduced the error in the average for this district from 18 to 10 bushels, but for the State as a whole the improvement from the use of this method was very slight. The Census Bureau frequency distribution indicated the low average yield of 19 bushels per acre for the group of lowest farm production in this District, with a higher average for each succeeding group. The highest group, or farms with a production of 1,000 bushels or more, had an average of 148 bushels which is almost eight times the average of the smallest group. Similar progressively higher averages held for all other districts and nearly all individual counties. A study of the Acreage & Production returns shows, as expected, a preponderance of reports from the larger producing and higher yielding farms. But the fly in the ointment seems to be that a majority of the reports for a county come from a certain portion of this sliding yield scale, while those for the next county may come from an entirely different part of the scale. Thus the yields as reported for one county are often below the actual county average and for another in the same locality they may be much too high.

This discussion and accompanying illustration is merely intended to point out the weakness in some of our sample yield data. The transfer of a portion of the errors in the sample into the county estimates cannot be avoided. If sample yield indications vary as much as 25 to 50 per cent in either direction from the Census figures, what degree of accuracy may we expect to attain in county estimates for the years without check data? It is probably true that potato reports contain a greater degree of dispersion and consequently a greater range of error in yields than those of many other crops, but a study of grain yields indicates also the probable existence of more serious errors in the reports than we are willing to believe. Such being the case, how far are we justified in setting up county estimates for other agencies that intend to use them as a basis for determining equitable benefit payments to individual farmers?

THE PROBLEM OF FORECASTING AND ESTIMATING YIELD PER ACRE OF CROPS

R. A. Bodin,
Statistician, Minnesota

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It is necessary, of course, to have a series of comparable data before any forecasts can be made. It might appear at first thought that a long-time series having many observations should be most valuable for this purpose. This is true if the series is one showing minor variations and in which data are comparable throughout. A long-time series enhances the possibility of including observations which at least appear to be similar to those at the time of forecast. It is difficult to make a reliable forecast unless similar situations have existed in the past. One danger in forecasting, however, is that conditions and observations may both appear similar to a prior time but actually are not because of new factors or bias, the effects of which cannot be accurately measured. Whenever that happens current short-time series are a better basis for forecasts because they compare better with conditions at the time of the forecast.

Lack of comparability in a yield series may come about in many ways due to influence of changing factors such as: shifts in areas growing the crops, changes in methods of cultivation, introduction of new varieties, extreme weather conditions, disease, insect infestation, changes in method of obtaining information as to time, method and questions asked, differences in editing and tabulation practices, and last, but not least, reporters' bias.

This last factor calls for special comment, as it is one of the most difficult with which a statistician has to contend and over which he has the least control. Whether a reporter is optimistic or pessimistic usually depends upon his current environment. It does not necessarily follow that because reporters as a group are pessimistic at one time that they are so all the time. The very next report made may be optimistic. Among reasons for bias are the immediate financial position of the reporter, his probable future financial position, condition of the crop prior to the report, either the preceding month or previous year, presence of disease or insects, and weather conditions prior to or at report time. When reports follow a year of severe drought the crop may look exceedingly good. A good or excellent crop outlook may suddenly decline to fair or even poor prospects, but the reporter sees nothing but gloom and crop failure ahead; the crop may actually yield a fair crop but not up to his early expectations. At such a time it is not uncommon for reporters to be too pessimistic. The reverse happens when conditions continue to be increasingly unfavorable, in which case downward bias early in the season may be an accidental aid towards making a more accurate forecast. Because of this constant danger of reporters' bias, it probably is advisable in making a forecast to consider other objective data bearing on ultimate

yield. Data of that type would include weather records, information on probable disease and insect infestation and any other data pertaining to factors closely related to yield. In theory, the reported condition reflects most of these factors, but sometimes there are adverse factors whose damage may not become apparent until several days or weeks after the report. Notable among these are the results of extreme heat at a critical time or the development of a rust epidemic. Field travel allowing actual observation is essential to intelligent evaluation of data at hand.

In estimating or forecasting yields the problem exists of establishing the proper absolute level of yields. Forecasts of yields must be based upon historic series of estimated yields. The basic data used in establishing the level of the estimates are usually census enumerations, which in themselves contain a large element of judgment. Even though the level of yield estimates is established from other sources, the problem remains of yearly sample data lacking comparability from year to year, or with the data used to establish the level of estimates.

In years of abandonment and in areas subject to abandonment it is difficult to determine whether reports are based upon seeded acreage or harvested acreage. In actual practice probably the basis of reports is a combination of planted and harvested acreages. Individual farm reports asking both seeded and harvested acreages as well as production may help in minimizing this type of error, or at least furnish a basis for measurement. Census data, whether on a planted or harvested basis, are subject to this same limitation.

Yield forecasts and estimates must of necessity be based upon reported yields. Hence, the ultimate accuracy of the forecasts and estimates can be no better than the reported or estimated series of yields. Aside from the matter of bias and the shortcomings of judgment, it is difficult to obtain representative returns. It is possible to send out reports in proportion to farms or acreages, but it is hardly possible to obtain returns in the same proportion. This point may be illustrated by the results from the October regular schedule for Minnesota 1931-1937, in which reporters were asked the "probable yield per acre of corn." During this period there were three drought years: 1933, 1934 and 1936. About the same number of schedules was sent out to each county each year during the period. About the same per cent of schedules were returned each year in each county; but the number reporting on <u>corn yields</u> varied greatly between years of severe drought and non-drought, and between counties in drought areas and non-drought areas. In drought areas the per cent of schedules reporting the item was only 59% for the drought year, while in non-drought years 93%. As between counties in the drought area and those not in the drought area for the three years (1933, 1934 and 1936) the return for the item in drought counties was only 59%, while semi-drought showed 83%. Apparently, reporters in drought areas tend to report only individual farm production items such as milk and eggs, and fail to report judgment items about which they cannot make up their minds or do not know what to report. Reporters tend to substitute comments for figures in times of distress. The result is that probably the areas most adversely affected are least represented in our samples,

although it is from these areas that we have need for a large return due to the wide dispersion in reports. Our good and usually reliable friend "compensation" undoubtedly comes to our rescue on a state basis, but there is the tendency of our samples to shift from poor to better areas due to the psychological effect of poor yields upon reporters.

SOME PROBLEMS OF FORECASTING AND ESTIMATING YIELD PER ACRE OF CROPS

J. A. Ewing,
Statistician, Maryland

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The ultimate yield of a plant is the sum total of the influence of environment and heredity upon it from the time of planting to harvesting. Every plant is specific in its requirements and these requirements vary at different stages of growth. The environment is made up of the factors of weather, soil, insects and disease, and culture, and isolation of the effect of any one factor is practically impossible.

Of the weather factors, light, temperature and moisture are probably the most important. Temperature is variable and its function in plant metabolism is next to water in importance. Moisture effects are very complex and are closely related with temperature. Transpiration helps to control temperature, while evaporation tempers the effect of precipitation. Air movement also affects the rate of both evaporation and transpiration. Humidity has a direct relationship with rust infection. Rust infection, in turn, increases the water requirement.

Soil varies in many ways but we are chiefly concerned with fertility. Where fertilizer application is general practice, the quantity and quality used each year is a problem. The availability of the amount used is even more difficult to determine.

Insects and diseases are hazards which may be anticipated but predicted with only a fair degree of accuracy. Changing cultural methods and the development of new varieties of crops also have direct effects on yields.

How are we going to account for the combined effect of all factors on the yield per acre of crops? We think this can best be done through our trained staff of crop reporters, supplemented by all other available data. A reporter's figure on condition is a composite of the outlook in his locality. We believe this figure represents the effect of all growth factors.

We need a large number of reports in order to cover these variations. This is especially significant if we are to make reliable county estimates. Various methods of yield forecasting have been tried, but that based on crop reporters' condition is the only practicable one found so far.

QUALITY OF PRODUCTION

What is our production? How much of our total corn production is unmerchantable? What is the average test weight of our winter wheat crop? How much of our hay is composed of weeds and other foreign material and what proportion has been weather damaged? How much weed seed and inert matter is included in our estimates of clover seed production? How much of our housed tobacco will be discarded in the stripping process?

During the past ten years on the College Park plots of the University of Maryland the average test weight of representative varieties of winter wheat has varied from 54 to 60 or No. 1 to No. 4. The merchantable quality of corn has varied from 63 to 95 per cent. During the years in which the wheat quality item was on our schedules it varied from 71 to 94. Corn ranged from 60 to 92. Maryland clover seed analyses made by the State Seed Laboratory last year showed an average by weight of 91.7 per cent pure seed, 0.3 per cent crop seed, 1.7 per cent inert material, and 6.3 per cent weed seeds. Of the 185 samples which were known to have originated directly from farmers the percentage of pure seed ranged from 30.3 to 99.7. This represents, of course, only a small part of the total production. We would expect the average for the State to be much lower. Dealers say that dockage varies from 5 to over 50 per cent. They expect to get about 80 per cent of pure seed by weight from their purchases. In the seed producing sections farmers buy most of their seed direct from growers and it is our understanding that very little of this has been re-cleaned. According to the grain inspection data of the Division of Grain Inspection, Illinois Department of Agriculture, there is a wide variation in the proportion of grain receipts falling in the different grades. These data are for the Chicago Terminal Market. Extreme percentage variations during the 15-year period 1922-1936 are as follows:

Winter Wheat:	No. 1	No. 2	No. 3	No. 4	Low Grade
1922	11	56	23	4	6
1930	58	36	3	1	2

Yellow Corn:	No. 1	No. 2	No. 3	No. 4	No. 5	No. 6
1927	Trace	5	15	19	27	34
1934	7	60	24	7	1	1

White Oats:	No. 1	No. 2	No. 3	No. 4
1935	2	16	46	36
1936	15	22	36	27

Barley:	No. 1	No. 2	No. 3	No. 4	Low Grade
1929	1	17	18	7	57
1935	25	41	24	4	6

These data show there is a wide variation from year to year in the quality of crops. Food or feed value varies largely as the quality.

If our estimates are to truly represent the food and feed supply it seems that quality as well as quantity must be considered and quality must be expressed quantitatively.

PASTURE

We are not getting quantitative data on pasture production. At the present time condition is not an index of production but perhaps a method might be devised for this. Values would vary by months. Around October 1 Maryland dairy cows secure an average of about 65 per cent of the total feed from pasture. A month later pastures furnish only about 40 per cent of the total feed. No practicable method of securing a measure of pasture production has occurred to us. Here in the East we have permanent, rotation, temporary and annual pastures. Up to the present time about the only measures of yield have been originated by the experiment stations. These agencies have expressed yield in pounds per acre, unit days and carrying capacity. Each month during the growing season our Maryland dairy farmers report the percentage of total feed being secured by the dairy herd from pastures. This appears to be a good indication of the amount of pasturage produced. Similar items could be carried for other grazing animals or perhaps one item for all species could be carried on the General Schedule. Pasture production is important because it represents a large part of the total feed supply and because its variations in production affect the supplies of other feed. The proportion of the total feed furnished by pastures as well as the variation in this proportion are well illustrated by the following data from our Maryland Dairy Surveys for the past six years:

Percentage of Feed Being Secured From Pastures

Range	May	June	July	Aug.	Sept.	Oct.	Nov.
High	42	81	88	80	83	76	44
Low	20	75	73	57	60	57	35

There is some indication that intensive methods of farming are giving way to extensive methods and that under extensive methods pastures are receiving intensive interest. If these changes become significant, we anticipate a demand for quantitative data on pasture production.

AN ARKANSAS COTTON YIELD PROBLEM

S. L. Bryan,
Statistician, Arkansas

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My experience in working with cotton yields in Arkansas during the past two years has brought to notice a cotton yield problem which probably exists throughout the Delta, and a similar problem may exist in other areas, for crops other than cotton.

The problem is this: In a heavy producing district, such as a cotton district in the Delta, will be found a few counties with yields much lower or much higher than the yields in the majority of counties in that district, which will cause the returns from a yield inquiry to show a distorted district average and, of course, one proportionately so for the state, unless each county in such a district has its proper representation of reports.

The ideal situation, of course, is one in which the returns from the inquiry result in a self-weighting report; that is, one in which the sample is so distributed that each county has its proper representation. While a representative sample is always our goal, it is, as you know, very hard to attain and harder still to maintain. A representative sample may be sent to the Field but the returns depend upon how well the growers reply in the various counties. In a state like Arkansas where over half of the farmers are tenants and half of the tenants are croppers and we receive no returns from the croppers, a representative sample fades from an expectancy to a forlorn hope.

A study of the Arkansas cotton yields from the December 1 Cotton Reports showed that low yielding counties in the Delta were generally over-weighted in the number of returns, while the extremely high yielding counties were usually represented by too few returns. Since county acreage estimates had been established for cotton for the period 1928 to date, we decided that, for the purpose of improving our state averages of reported yields, and also our charts, we would use the county acreages for weights, and weight the resultant district average yields by the district acreages to compute the state average yield. These weighted district yields showed a difference from the straight district yields previously computed of as much as 70 pounds cotton lint for some districts, and a significant difference for most districts. Some of these differences were compensating so that, for one year of the series, the state weighted average was changed only one pound. For all other years, however, a material change was made in the state yield and for several years the change was over 20 pounds.

By using county weights our figures were improved decidedly, as can be seen by our two sets of charts, one showing the previously weighted

If our estimates are to truly represent the food and feed supply it seems that quality as well as quantity must be considered and quality must be expressed quantitatively.

PASTURE

We are not getting quantitative data on pasture production. At the present time condition is not an index of production but perhaps a method might be devised for this. Values would vary by months. Around October 1 Maryland dairy cows secure an average of about 65 per cent of the total feed from pasture. A month later pastures furnish only about 40 per cent of the total feed. No practicable method of securing a measure of pasture production has occurred to us. Here in the East we have permanent, rotation, temporary and annual pastures. Up to the present time about the only measures of yield have been originated by the experiment stations. These agencies have expressed yield in pounds per acre, unit days and carrying capacity. Each month during the growing season our Maryland dairy farmers report the percentage of total feed being secured by the dairy herd from pastures. This appears to be a good indication of the amount of pasturage produced. Similar items could be carried for other grazing animals or perhaps one item for all species could be carried on the General Schedule. Pasture production is important because it represents a large part of the total feed supply and because its variations in production affect the supplies of other feed. The proportion of the total feed furnished by pastures as well as the variation in this proportion are well illustrated by the following data from our Maryland Dairy Surveys for the past six years:

Percentage of Feed Being Secured From Pastures

Range	May	June	July	Aug.	Sept.	Oct.	Nov.
High	42	81	88	80	83	76	44
Low	20	75	73	57	60	57	35

There is some indication that intensive methods of farming are giving way to extensive methods and that under extensive methods pastures are receiving intensive interest. If these changes become significant, we anticipate a demand for quantitative data on pasture production.

AN ARKANSAS COTTON YIELD PROBLEM

S. L. Bryan,
Statistician, Arkansas

* * * * *

My experience in working with cotton yields in Arkansas during the past two years has brought to notice a cotton yield problem which probably exists throughout the Delta, and a similar problem may exist in other areas, for crops other than cotton.

The problem is this: In a heavy producing district, such as a cotton district in the Delta, will be found a few counties with yields much lower or much higher than the yields in the majority of counties in that district, which will cause the returns from a yield inquiry to show a distorted district average and, of course, one proportionately so for the state, unless each county in such a district has its proper representation of reports.

The ideal situation, of course, is one in which the returns from the inquiry result in a self-weighting report; that is, one in which the sample is so distributed that each county has its proper representation. While a representative sample is always our goal, it is, as you know, very hard to attain and harder still to maintain. A representative sample may be sent to the Field but the returns depend upon how well the growers reply in the various counties. In a state like Arkansas where over half of the farmers are tenants and half of the tenants are croppers and we receive no returns from the croppers, a representative sample fades from an expectancy to a forlorn hope.

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By using county weights our figures were improved decidedly, as can be seen by our two sets of charts, one showing the previously weighted

averages, based upon district straight averages, and the other showing the effect of using county weights.

We have also weighted these same yield data with the preceding Census' county acreages instead of the annual county acreage estimates. While this procedure did not give quite as good results, it nevertheless did improve our original charts and probably may be used to advantage for crops for which county estimates are not available.

Since county cotton acreage estimates presumably will not be made currently, but will be delayed until after the revisions the following May, the preceding year's county acreages were used as weights experimentally, with practically the same results as when current county acreages were used. This would lead one to believe that the acreage relationship among counties in a district probably does not change so much in a year but that the use of the preceding year's county acreages for weights would result in a district weighted average yield much more representative than the straight average.

COTTON - 1928

District	Acreage Harvested (00) (1)	DECEMBER 1 REPORTED HARVESTED YIELD Straight Average (2)	Weighted Average (3)	Weighted Average (4)	Weighted Average (5)	Official Final Yield (6)
1	-	-	-	-	-	-
2	1277	138	150	153	-	169
3	7454	178	188	187	-	214
4	2842	109	121	115	-	154
5	2630	153	140	141	-	185
6	7991	145	147	146	-	189
7	3174	141	139	140	-	150
8	3585	115	115	115	-	140
9	4048	149	140	143	-	177

STATE:

(1) Total 33001
(2) Straight Average 140
Wtd.Ave.(Usual dist.wts.) . 147
(3) Weighted Average 148
(4) Weighted Average 183
(5) Weighted Average . . . . -
(6) Board Final Harvested Yield 180

Legend:
(3) Wtd. Ave. (Using current county acreage estimates)
(4) Wtd. Ave. (Using previous Census' county acreages)
(5) Wtd. Ave. (Using preceding year's county acreage estimates)

COTTON - 1929

District	Acreage Harvested (00) (1)	DECEMBER 1 REPORTED HARVESTED YIELD Straight Average (2)	Weighted Average (3)	Weighted Average (4)	Weighted Average (5)	Official Final Yield (6)
1	-	-	-	-	-	-
2	1345	180	186	188	186	166
3	7562	208	239	235	238	264
4	2551	107	118	113	117	139
5	2819	148	142	140	142	152
6	8461	182	187	182	187	199
7	3364	132	132	131	131	152
8	3829	165	165	166	167	167
9	4451	194	203	201	204	226

STATE:

(1) Total 34382
(2) Straight Average. 165
Wtd. Ave.(Usual dist. wts.) 174
(3) Weighted Average 184
(4) Weighted Average 179
(5) Weighted Average 183
(6) Board Final Harvested Yield 199

Legend:
(3) Wtd. Ave. (Using current county acreage estimates)
(4) Wtd. Ave. (Using previous Census' county acreages)
(5) Wtd. Ave. (Using preceding year's county acreage estimates)

COTTON - 1930

District	Acreage Harvested (00) (1)	DECEMBER 1 REPORTED HARVESTED YIELD Straight Average (2)	Weighted Average (3)	Weighted Average (4)	Weighted Average (5)	Official Final Yield (6)
1	-	-	-	-	-	-
2	1345	73	69	69	69	81
3	7748	117	128	127	127	154
4	2594	78	78	77	77	100
5	2950	69	69	70	70	99
6	8746	101	116	116	116	131
7	3231	73	76	76	76	88
8	3715	70	67	67	67	79
9	4628	117	123	123	123	127

STATE:

(1) Total 34957
(2) Straight Average 87
Wtd.Ave.(Usual dist.wts.) . 95
(3) Weighted Average 102
(4) Weighted Average 101
(5) Weighted Average 102
(6) Board Final Harvested Yield 119

Legend:
(3) Wtd. Ave. (Using current county acreage estimates)
(4) Wtd. Ave. (Using previous Census' county acreages)
(5) Wtd. Ave. (Using preceding year's county acreage estimates)

COTTON - 1931

District	Acreage Harvested (00) (1)	DECEMBER 1 REPORTED HARVESTED YIELD Straight Average (2)	Weighted Average (3)	Weighted Average (4)	Weighted Average (5)	Official Final Yield (6)
1	-	-	-	-	-	-
2	1165	223	224	221	223	195
3	7732	334	357	352	353	363
4	2310	179	180	180	179	204
5	2690	255	269	268	267	253
6	8265	271	278	279	278	286
7	2847	220	209	204	209	214
8	3512	239	231	232	232	223
9	4360	238	280	275	276	259

STATE:

(1) Total 32881
(2) Straight Average 253
Wtd.Ave.(Usual dist.wts.) . 254
(3) Weighted Average 276
(4) Weighted Average 271
(5) Weighted Average 273
(6) Board Final Harvested Yield 276

Legend:
(3) Wtd. Ave. (Using current county acreage estimates)
(4) Wtd. Ave. (Using previous Census' county acreages)
(5) Wtd. Ave. (Using preceding year's county acreage estimates)

COTTON - 1932

District	Acreage Harvested (00) (1)	DECEMBER 1 REPORTED HARVESTED YIELD Straight Average (2)	Weighted Average (3)	Weighted Average (4)	Weighted Average (5)	Official Final Yield (6)
1	-	-	-	-	-	-
2	1339	161	166	164	166	156
3	8005	229	255	252	256	294
4	2346	95	96	95	96	112
5	2651	132	129	130	129	142
6	8318	158	178	177	177	188
7	2976	122	136	135	136	138
8	3554	126	124	124	124	128
9	4412	134	135	136	135	149

STATE:

(1) Total 33601
(2) Straight Average. 149
Wtd. Ave. (Usual dist.wts.) 159
(3) Weighted Average. 171
(4) Weighted Average 168
(5) Weighted Average 171
(6) Board Final Harvested Yield 187

Legend:
(3) Wtd. Ave. (Using current county acreage estimates)
(4) Wtd. Ave. (Using previous Census' county acreages)
(5) Wtd. Ave. (Using preceding year's county acreage estimates)

COTTON - 1933

District	Acreage Harvested (00) (1)	DECEMBER 1 REPORTED HARVESTED YIELD: Straight Average (2)	Weighted Average (3)	Weighted Average (4)	Weighted Average (5)	Official Final Yield (6)
1	-	-	-	-	-	-
2	1035	169	175	173	175	161
3	6460	234	263	257	261	263
4	1753	151	146	143	145	142
5	1967	188	194	196	196	171
6	6065	196	215	215	215	205
7	2190	159	167	166	167	164
8	2704	157	147	147	148	148
9	3509	186	184	186	186	172

STATE:

(1) Total 25683
(2) Straight Average 185
Wtd.Ave.(Usual dist.wts.) . 192
(3) Weighted Average 204
(4) Weighted Average 200
(5) Weighted Average 203
(6) Board Final Harvested Yield 197

Legend:
(3) Wtd. Ave. (Using current county acreage estimates)
(4) Wtd. Ave. (Using previous Census' county acreages)
(5) Wtd. Ave. (Using preceding year's county acreage estimates)

COTTON - 1934

District	Acreage Harvested (00) (1)	DECEMBER 1 REPORTED HARVESTED YIELD Straight Average (2)	Weighted Average (3)	Weighted Average (4)	Weighted Average (5)	Official Final Yield (6)
1	-	-	-	-	-	-
2	775	69	67	67	65	70
3	5261	159	230	223	232	251
4	1611	95	96	95	95	118
5	1686	92	101	99	101	136
6	5230	175	198	197	197	235
7	1994	102	103	103	102	142
8	2206	114	114	114	114	120
9	2859	173	176	174	175	204

STATE:

(1) Total 21622
(2) Straight Average 123
Wtd.Ave.(Usual dist.wts.) . 142
(3) Weighted Average 166
(4) Weighted Average 161
(5) Weighted Average 166
(6) Board Final Harvested Yield 192

Legend:
(3) Wtd. Ave. (Using current county acreage estimates)
(4) Wtd. Ave. (Using previous Census' county acreages)
(5) Wtd. Ave. (Using preceding year's county acreage estimates)

COTTON - 1935

District	Acreage Harvested (00) (1)	DECEMBER 1 REPORTED HARVESTED YIELD Straight Average (2)	Weighted Average (3)	Weighted Average (4)	Weighted Average (5)	Official Final Yield (6)
1	-	-	-	-	-	-
2	776	127	138	137	137	132
3	5812	216	238	239	239	236
4	1299	111	109	111	111	109
5	1506	128	135	134	134	132
6	5748	172	180	180	180	191
7	2073	111	112	112	112	130
8	2297	127	126	126	126	130
9	3124	167	173	174	174	191

STATE:

(1) Total	22635					
(2) Straight Average		152				
Wtd.Ave.(Usual dist.wts.)		164				
(3) Weighted Average			174			
(4) Weighted Average				172		
(5) Weighted Average					172	
(6) Board Final Harvested Yield						180

Legend:
(3) Wtd. Ave. (Using current county acreage estimates)
(4) Wtd. Ave. (Using previous Census' county acreages)
(5) Wtd. Ave. (Using preceding year's county acreage estimates)

COTTON - 1936

District	Acreage Harvested (00) (1)	DECEMBER 1 REPORTED HARVESTED YIELD Straight Average (2)	Weighted Average (3)	Weighted Average (4)	Weighted Average (5)	Official Final Yield (6)
1	-	-	-	-	-	-
2	804	95	98	98	98	87
3	7092	242	298	289	290	291
4	1729	109	112	112	111	131
5	1899	139	146	144	145	178
6	6897	208	226	226	226	246
7	2538	150	148	151	150	179
8	2573	156	156	156	156	151
9	3729	226	241	243	242	261

STATE:

(1) Total 27261
(2) Straight Average 172
Wtd.Ave.(Usual dist.wts.) . 195
(3) Weighted Average 216
(4) Weighted Average 210
(5) Weighted Average 214
(6) Board Final Harvested Yield 227

Legend:
(3) Wtd. Ave. (Using current county acreage estimates)
(4) Wtd. Ave. (Using previous Census' county acreages)
(5) Wtd. Ave. (Using preceding year's county acreage estimates)

COTTON - 1937

District	Acreage Harvested (00) (1)	DECEMBER 1 REPORTED HARVESTED YIELD Straight Average (2)	Weighted Average (3)	Weighted Average (4)	Weighted Average (5)	Official Final Yield (6)
1	-	-	-	-	-	-
2	847	191	194	195	194	185
3	8014	281	323	312	319	335
4	1763	209	203	204	202	233
5	2092	204	210	207	209	232
6	7837	276	292	293	292	306
7	2818	188	199	196	198	211
8	2753	226	223	223	224	218
9	4425	315	315	312	313	322

STATE:

(1) Total 30549
(2) Straight Average 237
Wtd.Ave. (Usual dist.wts.). 259
(3) Weighted Average 275
(4) Weighted Average 267
(5) Weighted Average 272
(6) Board Final Harvested Yield 287

Legend:
(3) Wtd. Ave. (Using current county acreage estimates)
(4) Wtd. Ave. (Using previous Census' county acreages)
(5) Wtd. Ave. (Using preceding year's county acreage estimates)

METHODS AND PROBLEMS IN ESTIMATING FRUIT PRODUCTION

R. R. Royston
In Charge Fruit and Vegetable Section

* * * * * * *

OBJECTIVES AND DEFINITIONS

In estimating the production of any crop it is first necessary to define what we mean by production. At first glance this seems a simple matter. Production would seem to imply the total quantity or volume of a crop produced in a state or in the United States during a given season. For fruit crops, it seems reasonable at first thought to define total production either as "the total quantity of fruit reaching maturity" or "the total quantity of fruit harvested". But the latter definition would exclude all marketable fruit unharvested because of low prices or other economic factors. Since prices received by growers are a function of the total available supply, including this unharvested fruit, it is desirable to include such unharvested fruit in production and classify it as "economic abandonment".

It would seem that a definition of estimates of fruit production falls somewhere between the "total quantity of fruit harvested" and the "total quantity of fruit reaching maturity". The exact point between these two extremes is sometimes difficult to determine, but should be established by an examination of the following practical assumptions:

1. Production should include all fruit utilized, such as
    a. Shipments for fresh consumption by rail, boat, or motor-truck.
    b. Roadside stand and local sales.
    c. Sales to processors or processed on farms and sold.
    d. Fruit consumed by families on farms where grown.
    e. Harvested fruit fed to livestock.
2. Harvested fruit wasted, including loss from culling, and from decay while in storage.
3. Fruit left on trees because of low prices or other economic factors, such as labor shortage at picking time. This part of the crop is classed as "economic abandonment".

Production estimates based upon the above categories could be defined as, "Total fruit produced less the loss from natural causes". This definition includes "drops" or "windfalls" which are picked up and utilized, but does not include normal loss of such fruit. It includes fruit which is harvested but is lost later through culling or grading operations, through decay while in storage, or is dumped because of low prices.

Unharvested fruit would be included in production where such quantities represent a significant volume of marketable fruit which ordinarily would have been picked had prices been high enough to justify the expense of harvesting.

It is sometimes difficult to determine when an allowance for "economic abandonment" should be made. A certain quantity of fruit is left on the trees every season. If interpreted literally "economic abandonment" probably should include all such fruit, no matter how small the quantity. Actually, we ignore the "usual" quantity of unharvested fruit and do not consider it in our estimates of production.

The problem of deciding when estimates of "economic abandonment" of fruit crops should be made and what they should include, probably can be simplified by attempting a more specific definition of the term. In the light of established procedure it would seem that "economic abandonment" could be defined as "that quantity of marketable fruit left on the trees, excluding the quantity which is not picked because of immaturity, or is normally overlooked in picking operations". This definition may not be perfect, but it should be helpful.

METHODS OF ESTIMATING PRODUCTION

The Basic Par Method:

It has not been possible to estimate production of fruit crops by the same methods used in estimating field crops. The problem of estimating the production of a field crop, such as corn, wheat, or cotton, can be approached by estimating the acreage harvested and the yield per acre. The number of trees of bearing age, or the bearing surface of fruit trees of bearing age in a State, corresponds in a general way with the acreage planted to a crop. Unlike annual crops, the bearing surface of fruit trees is not likely to vary greatly from year to year. It is safer, therefore, to project a trend of bearing surface than it would be to attempt to project the acreage of a crop like wheat or cotton. At the present time the projection of the numbers of bearing trees is made largely on the basis of changes in the numbers of trees between Census years. More dependable information is needed concerning the annual changes in numbers of bearing trees in order to determine the "basic" par production for each State.

The basic par method is an approach by which the growers' reported condition or per cent of a full crop is translated into actual quantities by applying the reported figures to a par or 100 per cent equivalent production. Basic pars were calculated for Census years by dividing the Census production by the "per cent production" reported by growers at the end of the harvesting season. Theoretically, the basic par or 100 per cent equivalent production represents the full producing capacity of orchards in a state for a particular season. In practice, however, the basic par has come to mean that production of a fruit that would be realized if the average of reports from all growers was 100 per cent.

The basic par, or 100 per cent equivalent production, is set up at the beginning of each season after taking into consideration all available information on the change in the number of bearing trees and the trend in bearing capacity, or par per tree. As indicated in a previous paragraph, more adequate information is needed concerning ages of trees, new plantings, and removals, in order to accurately project these basic pars for intercensal years.

The par set up at the beginning of the season is not changed unless additional evidence comes to light showing that the original par was out of line with the facts. In other words, the basic par is a seasonal par, and does not need to be adjusted for a monthly trend in condition. This trend is allowed for by charting monthly condition against the final per cent production obtained at the end of the harvesting season. Thus, the growers' reported condition is interpreted as "per cent production" and the latter figure is applied to the basic par to obtain the indicated production.

The basic par method, as used in estimating production of fruit crops, has the following points in its favor:

1. The basic par can be easily calculated for Census years.
2. It can be charted or projected on semi-log paper for intercensal years to show, at a glance, the trend in the bearing capacity of the orchards or vineyards in a state or in the United States.
3. The number of bearing trees can be entered on the same chart to show the correlation between these numbers and the par or 100 per cent equivalent production.
4. Since the basic pars are set up at the beginning of the season, the Board's monthly review of fruit indications is reduced to a minimum when time is at a premium.
5. The "par" times "per cent production" calculations are simple and can be made in the computing section very rapidly.

Alternate Methods:

More research work also should be carried on toward investigating alternate methods of estimating fruit production. Some preliminary studies of this nature have been conducted in the Washington office on the correlation method. This method consists of correlating production with per cent of a full crop and with trend. It has been used with some success on Florida and Texas citrus crops and has been suggested as a substitute for the par method on all fruit crops.

In our preliminary studies we have used the graphic correlation method, employing the following steps in the procedure:

1. For mid-season estimates chart monthly condition against reported per cent production in order to interpret the current condition as "per cent production".
2. Chart the reported per cent production at harvest directly against the total production and establish the line of best fit by means of the "group average" method.
3. Chart the actual residuals (in terms of bushels) against time, or
4. Chart the residuals, as percentages of readings on the regression line, against time.
5. Establish lines of best fit for these residuals to show the trend.

Theoretically, the correlation method provides for measurement of bias in years of big crops as the regression line is permitted to curve for years when high per cent production figures are reported. Actually, there is little evidence of such a curvilinear relationship. A thorough testing of this method would require sufficient check records of fruit utilization to make accurate estimates of the crop entirely independent of the estimates set up by existing methods. In the absence of adequate production check records, correlation studies simply carry us around in a circle, for we would be trying to test the relative merits of the par method and correlation method by applying correlation technique to estimates already established by the par method.

Other methods which should be investigated in forecasting fruit production or in checking estimates made by the present technique, are as follows:

1. Special individual farm schedules asking growers to report, for their own orchards, actual production last year and prospective production this year. This type of special inquiry has been used in some states for a number of years. It seems especially suitable for use in commercial fruit areas but is probably biased for current year reports. The results, however, could be used on a relative basis by the second or third year, especially in checking the previous year's estimates. More study of this bias factor is needed.
2. Cruising method, consisting of personal visits of the statistician to key orchards at intervals during the growing season to make judgment forecasts of production per tree by varieties from sample trees. This method has been tried in several states for apples and also for citrus. The limited experience with this method is encouraging. The technique of accurate cruising should be developed and the possibility of expanding its scope to include definite measurements of the fruit should be explored. This method can be used for forecasting or for checking the previous season's estimates.
3. Objective methods involving studies of the effect of weather factors on production, or the relationship of fruit measurements to size of the crop. This is a relatively unexplored field and its possibilities can be determined only on the basis of experimental crop-weather research extending over a number of years. Crop-weather measurements should be studied during the growing season and at harvest time.

To a large extent, the possibilities of developing any new methods of estimating fruit crops are limited by the lack of accurate check data on annual production. We are forced to conclude, therefore, that the development of better methods of estimating fruit production depends in a large measure on the parallel development of such check data.

During the last four years attempts have been made to collect more comprehensive data on numbers of trees by leading varieties and age groups,

and to build up estimates of production from records of utilization. Special fruit surveys have been conducted in several states, through funds provided by the Works Progress Administration or other agencies. Since these surveys have been made in different years and with a type of personnel not always adapted to the work, it has been difficult to coordinate the results to the best advantage.

SAMPLING PROBLEMS

Mailing schedules to a list of voluntary reporters in each State appears to be the most practical means of collecting the timely information needed for making the forecasts of production. There are some practical problems of sampling fruit production, however, which can be discussed with profit.

The first problem relates to editing the fruit items on the general schedule. Editing condition reports is very difficult in years of unfavorable growing conditions because of the uncertainty regarding zero reports. For field crops it is the policy to edit out all zero condition reports because these apply to acreage on which the crops are a failure. On fruit crops, however, the policy is to include zero reports in the average of condition <u>where these reports represent crop failures.</u> This difference in procedure on fruit crops is necessary because the basic fruit pars represent the 100 per cent equivalent production of all trees of bearing age in orchards, including those which may have no fruit on them during a given season.

In a season following the wholesale destruction of fruit buds or the killing of trees by severe winter freezes, there will be many zeros reported for the condition of fruits. Most of these will represent crop failures. Some of them, however, are used by reporters to signify that no fruit crops are grown in their localities. The problem, then, is to edit out zeros of the latter type and to include those representing crop failures. This is a job which requires an intimate knowledge of the location of particular fruits in a State and a familiarity with the personal peculiarities of reporters. Moreover, it is a job which requires consistency of judgment and of editing practice on the part of the statistician from year to year.

The editing problem is especially vital in a Census year in which much of the fruit crop is a failure. Such a situation occurred in many of the eastern States in the Census year of 1934 following the extremely low winter temperatures of the winter of 1933-34. As a result of the difficulty in editing zero reports that year, some of the State averages on "per cent production" are of doubtful reliability and the par levels and production estimates established from these averages and the Census production are equally uncertain.

It is possible that some of the difficulty in editing fruit condition reports may be eliminated by a modification of the instructions on the general crop schedule. If reporters could be educated to the use of a system of symbols in which the zero has no place, most of the problem of

editing would be solved. In this connection, the use of the letter "F" might be suggested to designate crop failure and the word "none" used to signify no abandonment of acreage or no stocks of grain on hand.

A problem closely related to editing zero condition reports is that of adjusting the fruit par for the season immediately following the killing of fruit trees by winter freezes. At first thought it appears that the par should be lowered immediately from the previous year's level by a percentage roughly equivalent to the proportion of bearing trees killed. This procedure assumes that growers promptly forget the trees which are killed in a locality, although these dead trees may remain standing in the orchards for some time. Under this assumption conditions would be reported only on the live bearing trees remaining in orchards.

We believe that reporters remember the trees which were killed by freezes during the previous winter months and take these tree losses into consideration when reporting per cent of a full crop during the season immediately following the loss. Accordingly, the practice is to lower the par only slightly for the crop immediately following a severe loss of trees by winter freezes, but to make a considerable reduction in the par for the second crop following the winter killing. It may even be necessary to make a further reduction in the par the third season following the freeze, since other weakened trees may die and the number of young trees coming into bearing may not be sufficient to offset the additional mortality of the older trees.

Obtaining a representative sample is probably the most important of all the sampling problems. Representativeness is improved by a geographic stratification of the sample by crop-reporting districts or by counties. In the important commercial fruit areas of a State it is now a common practice to stratify and weight the sample by counties.

The type of weights is also important in obtaining a more representative State average condition. In earlier years the number of bearing trees, as shown by the Census, was the basis of most fruit weights. In 1932, however, the Washington office strongly recommended the use of 100 per cent equivalent production weights. These weights are superior to the tree weights because they give the commercial areas a rating more nearly in proportion to their relative importance. Since commercial orchards have a higher bearing capacity per tree, weights based on number of bearing trees tend to minimize the importance of areas which have highly developed commercial orchards.

Prior to 1930, the sample of fruit condition was obtained, for the most part, from the list of general or "regular" reporters; that is, the list to which the general schedule is sent. There has alsays been some question on how well the reports on fruit crops from this general list represent the changes in fruit production from year to year. This led to the establishment of special lists of fruit reporters in a number of States. These lists were built up from names of fruit growers in commercial areas in order to obtain more representative data on fruit crops in those areas.

If the fullest use is to be made of these "special" reports on fruits, and if the review of fruit indications by Board members is to follow a consistent policy, it seems necessary to develop a fairly simple and uniform procedure for the consideration of the special and regular data. The question is, what procedure should be followed in handling the special and regular indications?

The use of special reports as a separate indication of production has been used to some extent in Washington and has certain advantages. It is a simple method and preserves the identity of the special reports. On the other hand, this method injects the same element of personal judgment as the old method. When the "special" chart reading differs materially from the "regular" chart reading, the adopted figure on "per cent production" must be determined by judgment. And we know that judgment of a statistician (both the field and Washington type) is not always consistent under the same conditions.

A more serious objection to the use of special reports as a separate indication is the fact that this method represents, to a large extent, a prediction of the figure which the regular reporters will report at the end of the season, since the Board's final figures are rather close to the regular reports. The method therefore fails to give proper representation to special reports both in the figures adopted by the Board.

The method which seems to hold the most promise is to combine the special reports with the regular reports for the full period of years covered by the specials. This method involves the following steps:

1. Calculation of straight averages of all reports, by counties, for the monthly condition figures and the "per cent production" reports.
2. County averages calculated in this manner would be weighted the usual way to obtain the State weighted average. Combinations would be made on a county basis only for the commercial counties; the averages for the remaining counties would be made on a district or partial district basis. Weights should be determined on the basis of the 100 per cent equivalent production for each county or area.
3. New charts would be made, plotting the monthly condition averages of the combined reports against the combined data on "per cent production". For years prior to the period covered by the combined data, the condition established by the Board from regular reports would be plotted against the Board's "per cent production" and these years plotted in a different color on the same chart.
4. The practice of combining the special and regular reports would be continued in future years and the "per cent production" interpretations would be made from the new charts.

5. For the past years for which the combination of reports is made, the new "per cent production" figures would be divided into the published production estimates to determine a new 100 per cent equivalent production series. The current season's par would be established on this new level.

The combination method has the advantage of setting forth a definite and uniform procedure. It also provides a more adequate sample of reports from commercial counties, thus giving the stability necessary for weighting by counties. It provides for the proper representation of special reports in the condition and per cent production averages. Finally, it simplifies the work of the Board reviewers in removing the uncertainty regarding the procedure to be followed in evaluating two sets of indications.

A test of the method was made by combining the special and regular reports on the per cent production of Virginia apples for the years 1930 through 1937. The new par level developed from the combined averages was not greatly different from the old par level and the variations for individual years do not appear to be significant. Judging from this test, it should be possible to project pars on the new level without a great deal of difficulty.

Should the combination method be adopted for handling special reports, it would be necessary to make exceptions to this method in a few states where fruit crops are grown principally in restricted commercial areas and the farm orchard crop is insignificant. In these cases, such as grapes in New York and Pennsylvania, and peaches in Colorado, special reports have been the only reliable indication of the crop and have been used exclusively for a number of years.

ESTIMATING COMMERCIAL TRUCK CROP ACREAGES

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At the outset, it should be emphasized that the truck crop estimator has a difficult task. The methods employed in handling major field crops cannot be used very extensively in estimating truck crops. The chief requirements of a truck crop man are resourcefulness, ability to contact people, and excellent judgment. Often he must substitute a "feel" of the situation for reliable indications. He frequently has to take long chances and if he lacks a sense of proportion and a sound idea as to what is reasonable he comes to trouble.

Only infrequently are schedules and charts among the tools of his trade. Check data, such as census material, shipment figures, etc., are pitifully inadequate. He cannot hope to keep his per cent of error down as low as statisticians handling generally grown field crops. Not all of his difficulties come from lack of indications and insufficient check data. Truck crops are inherently hard to estimate because of the extremely wide variations from season to season in the area planted and in the yield per acre. Also, acreage as well as prospective yield can change drastically at any point between seedtime and harvest. Vegetables are particularly susceptible to weather, disease and insects. Vast acreages can be wiped out overnight.

In securing a basis for estimating the acreage of a given commercial vegetable crop, the estimator may use one or all of several approaches. The purpose of this discussion is to briefly outline the various methods developed in the course of the writer's experience.

Schedules:

Seldom can acreages be established by the use of schedules alone. Sometimes it is possible to get fairly good indications from the "opinion per cent change" schedule, and at times even with the "individual farm acreage" survey. These instances occur where the area planted to a crop is large and the crop is grown quite generally over the area without violent shifts from year to year. Whether or not schedules can be used as the basis in formulating an estimate in any given instance, it is believed they should be employed as a regular adjunct to other methods. Although it may not be feasible to list the schedules, secure averages, and use these averages as a variable for a chart reading, still a man who knows his territory and the individual characteristics of many of his reporters can use these schedules to aid him in building up an estimate. The reporter's figures and accompanying comments often give valuable leads.

Key Men:

One of the most frequently used methods of securing information is contacting informed men in the field. This may be done by letter, telephone,

telegraph, or by personal call, but preferably by personal call. The idea back of the personal contact is that there are men in nearly every commercial vegetable area that have reliable information concerning plantings in their locality. Generally a schedule cannot be devised to elicit from these men all the information they have. Many of them will not answer schedules. Some will talk freely, others will have to be persuaded to give information, and some will not talk at all. Some years a certain individual will have complete and reliable information, while on other occasions his information will be faulty or incomplete. In order to evaluate the material these men give, it is desirable that the estimator talk directly to them and determine whether they really know or are guessing. Also, it usually takes considerable conversation to secure a complete statement of the contact's opinion, the facts upon which he bases his opinion, etc. Not infrequently the key man's information is misinformation, not necessarily deliberately so, and the estimator needs the benefit of the personal contact in order to determine the worth of the individual's statements.

Thus one of the important methods of estimating acreages is to go from locality to locality and talk with farmers, shippers, railroad agents, county agents, bankers, etc., and get their opinions. Some of these opinions are good, and some very poor. Some statements received are based upon reliable factual information, and others are just bad guesses based upon nothing tangible. As the estimator goes from person to person and from locality to locality, he begins to get a sense of direction and usually becomes able to judge as to who is giving good usable information and who is not. He gradually gets a picture of the situation. How good his picture is depends upon his sense of proportion and judgment.

Enumeration:

The census may not furnish a great deal of help to the truck crop estimator but very frequently the truck crop estimator becomes a census enumerator. Not that he can go from farm to farm and enumerate acreages, although he may occasionally do this, but often he can find some person in a locality that has made an enumeration of acreages. In this instance he must attempt to appraise the enumeration and find out if it has been accurately made. Such local surveys are made by chambers of commerce, by an interested shipper, by railroad agents, county agents, and others. One of their weaknesses is lack of thoroughness. Some farmers will not tell anyone what their plantings are, and this forces the enumerator to estimate. Often only the more important growers are covered by the survey and a lump estimate made for the small growers.

In some cases the acreage in a locality is all under the control of a few large operators who are financing the crops. The estimator then can canvass the various operators and secure from them the acreage they control. Usually fairly good figures can be built up from this canvass as most operators will give the estimator fairly reliable information. In case of doubt, it is generally feasible to check an operator's statement.

If no enumeration has been made for a locality, the estimator may be able to find some well informed person in the community that can list

the farms growing vegetables and give reasonably good estimates as to the acreage on each farm.

Wherever enumerations of the foregoing types can be secured, they afford a good way of setting acreage figures. As a rule such enumerations cannot be secured where the acreage is large or where there is no well-defined line of demarcation between localities, that is, where one locality joins another without an intervening non-vegetable-growing area.

Seed Data:

Sometimes it is possible to learn the quantity of seed planted in a given area. An example is the Lower Rio Grande Valley of Texas. All potato seed for spring planting has to be shipped in from the north. Railroads are able to segregate seed shipments from table stock, and they willingly furnish this information. In the past, accurate acreage figures have been determined from this source. Similarly, the fall crop in the Valley is grown from seed saved from the spring crop and placed in local cold storages. A survey of the cold storage plants in late summer is the best approach to estimating the fall acreage.

In isolated localities it may develop that one firm furnished all of the seed of a certain crop and it is possible to secure the total quantity from this firm. Sometimes seed data can be used only to set the upper limit of the probable acreage. The seed may not all be planted, some seedings may never come up and replanting may become necessary, and often planted acreage has been lost after the seed came up and before the survey is made. In such cases, knowing the upper limit and then deducting from it acreage loss from the various causes gives a check that can be used along with other approaches to the problem.

Irrigation Records:

Although I have never had access to reliable records from irrigation companies, I understand that in some states it is possible to get plantings from this source.

Crop Meter:

Again I have had no experience, but believe that the crop meter has been used successfully in at least a few instances. To be practicable, I presume the crop measured would have to be quite generally grown in the area surveyed.

Final Check-up:

Other men probably can add something to the outline of methods of securing acreage information. Certainly the foregoing methods offer various ramifications. Last, but not of minor importance, I wish to mention the value of the post-season check-up in determining acreages. That historic figures are of prime importance requires no argument here. It is after the season has ended and all the available check data are in that the estimator should sit down with an open mind and analyze what

happened. He should start with the premise that every figure he recommended and every figure that was adopted during the growing, harvesting and marketing season can be wrong. If he finds that the final production did not turn out in line with his forecast, he should not blindly assume that the acreage figure established early in the season was correct and that therefore he took the wrong yield. It is easy and dangerous to adjust the yield per acre to secure the correct final production.

In setting up the final production figure, if the wrong acreage has been maintained, thus necessitating the adoption of a wrong yield, two errors are committed that go into the records for all time. These errors in yield and acreage may come up two or three years later to plague the estimator. This is particularly true when a similar crop year occurs. Then, too, we tend to work forward from last year's estimates and if that basic year is wrong we stand a good chance of multiplying an error.

It is hard to admit to an error even after the story is "cold" and no one else cares, but if I were to suggest a possible way of improving truck crop estimates that the estimator can put into immediate practice, it would be an honest appraisal of what actually happened. I am convinced that in a great many instances the post-season analysis has resulted in the adoption of a wrong yield to derive the desired final production figure when an open-minded appraisal would have resulted in a correction in the acreage figure.

If a man can calmly survey the entire situation at the end of the year and find where he made his mistakes, definitely he is in position to do a better job next season.

SOME SUGGESTIONS FOR IMPROVING ESTIMATES OF FARM CONSUMPTION AND ECONOMIC ABANDONMENT OF FRUIT AND NUT CROPS

C. N. Guellow, California

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Estimates of cash income are usually prepared by first estimating that portion of a crop which was sold, and then applying to that figure the estimated season average price. In order to estimate sales accurately, it is necessary to know "how much was not sold", or, in other words, how much was used in the farm household, and how much remained unharvested.

During the past few months I have had occasion to do considerable revision work on estimated sales of fruit and nut crops for the period 1909 to 1936. In working with these estimates it has become increasingly apparent that adequate information is lacking in most states as to (1) average home consumption per farm of the various fruit and nut crops, and (2) economic abandonment of these crops.

The matter of home consumption as related to "total sales" estimates is more important in some states than in others. In California and some of the other western states, and even in certain eastern and southern states, at least for certain crops, individual plantings are comparatively large and almost entirely of a commercial nature. In these states home consumption usually constitutes only a small percentage of the total production and remains more or less constant from year to year. In those states where the predominating unit is the farm orchard, however, the matter of farm consumption is extremely important when considering estimates of quantities sold.

The importance of economic abandonment varies from year to year. An attempt has been made in some states to estimate this for years of excessive abandonment, but there have undoubtedly been some years when allowances were not made for unharvested fruit when such allowances should have been made. This was probably because there was no reliable method available for determining just what such losses amounted to.

The most logical solution to the problem probably lies in the development of some sort of schedule information. In order to insure the best possible return, and a minimum amount of bias from such an inquiry, the schedules should be mailed out as soon after the close of the harvest season as is practicable for such crops as peaches, pears, grapes and cherries, and sometime during the following spring for apples. By sending out the apple inquiry in the spring, a more accurate indication of home consumption would probably be obtained, because a large portion of the apples used on farms are placed in common storage and consumed during the winter and spring months. The schedules should also be as brief as possible. It would indeed be desirable to have schedule information for all utilization channels, but past experience

in most states indicates that when a utilization schedule is used which carries a large number of questions the return has been very poor and the indications have not been very dependable. It would therefore seem advisable to ask two questions only for each crop: (1) "Of the total quantity of peaches produced on this farm this year, how many bushels were used in your farm household?" and (2) "What is your estimate of the <u>per cent</u> of the total peach crop <u>in your locality</u> this year that remained unharvested because of low prices?"

I believe that such an inquiry would at least be worth trying. The findings will, of course, become more valuable after indications have become available for a series of years.

It is realized that the field offices are already carrying a heavy load and that they are not anxious to take on any more new projects than are absolutely necessary. However, we are faced with the necessity of preparing cash income estimates. More and more emphasis is being placed on the importance of such estimates, and if we are to "stand back" of them as a Division or Bureau, I believe it is contingent upon us to adopt such refinements of method from time to time as are reasonable and practical.

SOME PROBLEMS INVOLVED IN ESTIMATING COMMERCIAL APPLE PRODUCTION

Samuel J. Gilbert,
Associate Agricultural Statistician

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DISCONTINUING THE COMMERCIAL APPLE ESTIMATE MADE ON THE OLD BASIS

In 1937, after considerable discussion, it was decided that the estimate of commercial apple production should be dropped. Among the reasons for this probably the most outstanding were:

1. The definition of the Commercial Crop as that "sold for fresh consumption" was difficult to explain and apparently not understood by the public.
2. The estimate was based on per cent of full crop against pars which involved the difficulty of forecasting economic factors and their influence upon the proportion of the crop which would be marketed.
3. No complete check data were available for truing up estimates of the commercial crop for previous years.

Definition:

Much confusion resulted with the definition of the commercial apple crop being: "That part of the crop sold for fresh consumption." One more or less common concept of the commercial crop was that it was the total crop produced in commercial orchards, commercial orchards being a term given varying interpretations. Another idea has been that the commercial crop meant the total production of certain important areas. Other ideas existed with generally little consideration being given to the production of apples for sale as fresh fruit from general farm orchards. Consequently, opinions of the commercial crop have been based on the particular concept existing in the locality or with the individual.

Par Approach Requires Forecast of Economic Factors Implied in the Definition of the Commercial Crop:

The difficulty of forecasting price levels is quite apparent. Our previous definition of the commercial crop and the use of a par introduces the anomaly of forecasting price based in part on supply and forecasting supply which rests in part on the forecast of price. Par for a given month or year also involved the acceptance of previous estimates based on the same or similar procedure and not revised on the basis of complete check data.

Also the per cent of full crop reported by crop correspondents as applied to commercial par appears indefensible. The sample may or may not reflect the size of the crop in the important commercial orchard areas since commercial orchardists have specialized farms and are not commonly crop correspondents. Doubtless recognition of this and other difficulties resulted in the effort on the part of statisticians to obtain reports from orchardists through the use of special inquiries to commercial growers. It has not appeared possible to make satisfactory use of such reports, as was pointed out by Mr. Royston.

Complete Check Data on Fresh Fruit Sales Not Available:

Car loading records are available for an end-of-the-season check-up, but truck movement, which has become an important factor in recent years, has generally remained an unknown quantity. About the only check which can be made upon truck movement is from the reports of growers on disposition and utilization of the crop, combined with into- and out-of-storage sample from cold storages.

SOME PROBLEMS INVOLVED IN ESTIMATING THE COMMERCIAL CROP ON AN AREA BASIS

Due to the difficulties in continuing estimates of commercial apple production on the old basis, and since it appears that commercial apple production estimates are to be reinstated, at least one alternate suggestion has been made. This is that commercial apple estimates be made on a <u>commercial area</u> basis -- the total crop being estimated for the areas or counties more important in producing apples for market.

Considerable reworking of available material appears necessary to re-establish commercial apple estimates on an area basis. Certain problems require specific treatment.

Satisfactory County Bases:

At present, except for recent and limited area studies, county or area estimates would have to rest upon the regular Census enumerations. The fruit production enumerations of past censuses have been criticized by some of the orchard people as lacking in dependability. Such criticisms have usually had little or no factual material given in support.

Securing an Adequate Sample on Per Cent of Full Crop:

As mentioned earlier, the crop reporter sample on per cent of full crop appears to be inadequate for use in estimating total crop in a commercial area. A larger sample from apple producers also with adequate representation of general farms in the area is necessary in arriving at per cent of full crop in a commercial county or section, if the total crop is to be estimated. This raises the question of possibly stratifying the sample and developing an adequate set of weights. Data for such

procedure is not generally available. A special current survey and subsequent change in Census questions appear necessary for any breakdown of a sample on the basis of commercial and non-commercial orchards in a so-called commercial area. While this problem may not be important in commercial sections where there are few general farm orchards, it will in all likelihood be a weak spot in any commercial estimate (estimate of the total crop) in a given area.

Reworking Available Material for Use in
Current Estimates of Commercial Production on an Area Basis:

In thise states where special inquiries have been used in past seasons it would appear necessary to rework the material to place it upon the selected area basis. Possibly examination and retabulation of reports from general crop reporters known to have large orchards would be helpful in developing a series of indications for commercial sections, although this does not appear to offer much promise. Combination of such crop correspondent reports with available material from special surveys might be helpful in some states.

The number of schedules returned in West Virginia from special inquiries on per cent of full crop has varied considerably, with the sample generally being small and improperly distributed. Doubtless in some states the special inquiries may yield strong and consistent enough indications to give a background for commercial estimates on an area basis.

Continued and greater use of special through-the-season inquiries on condition and per cent of full crop appears necessary in any adequate approach to the problem of making commercial apple estimates. Reasonable standardization of such inquiries appears to be indicated.

Experience in West Virginia indicates that a special schedule covering per cent of full crop <u>by varieties</u> is too detailed. This material cannot be weighted properly in the absence of adequate information on the number of trees of bearing age by varieties. A comparatively simple schedule on per cent of full crop (or condition) for the orchard or orchards under the management of the reporter and also for his community as a whole appears to be more acceptable and to result in larger returns.

Special Field Contacts and Records:

Contact of the larger producers in West Virginia has led to better understanding of the estimates and apparently to greater confidence. Three growers in the State will normally produce from one-tenth to one-sixth of the "commercial" crop. Through some knowledge of the records kept and an acquaintanceship with producers a larger sample has been possible on disposition of the crop for the end-of-the-season check-up.

Field Cruising:

Field cruising was given a casual trial in West Virginia in the 1935 crop season. It seemed to offer some possibilities if continued each year, although the time and expense factors are quite limiting.

End-of-Season Check-up:

For several years three special check-up inquiries have been used in West Virginia for the purpose of revising our annual estimates of the apple crops.

A commercial apple inquiry has been sent each spring to a group of about 650 orchardists. It attempts to obtain complete information on the disposition and utilization of the crop. While apparently adequate samples have been obtained it appears that further field work must be done. For example, during the past season it was discovered that one grower on the West Virginia-Maryland border may ship some 50,000 to 70,000 bushels of West Virginia apples via Maryland railroads or an equal quantity of Maryland apples via West Virginia roads. Another difficulty with the producer sample is that the inclusion or exclusion of a single grower's report may make a great difference in the indicated carlot and truck movements, affecting the break-down of the commercial crop as well as the indicated total.

The second special check-up inquiry is sent to cold storages. It covers the methods of movement into and out of storage and obtains an opinion statement on the movement of apples out of storage by truck as compared with the previous season. Our sample for this inquiry is practically a 100 per cent return.

The third inquiry, an apple by-products report, goes to only the few processing plants. Three plants account for the bulk of the West Virginia apples canned, made into cider, vinegar, butter, dried products, etc. Virtually complete coverage and reasonable accuracy appears to characterize this sample.

Use of the three types of inquiries permits cross-checking our movement whether by truck or rail, sales to processors, and cold storage, with an indicated balance against total and commercial estimates. With the removal of some uncertainties in regard to origin and destination it appears that we may expect a satisfactory end-of-the-season check-up this year.

SUMMARY

The problem involved in making commercial apple production estimates on the per cent of full crop and par basis appear to offer difficulties which raise a question as to the advisability of reinstating estimates on this basis. It might be done as a stop-gap until a new basis can be developed.

Estimates of total production on an area basis would seem to require eventually much reworking of old material, the general use of special surveys on per cent of full crop and end-of-the-season disposition and movement inquiries, possibly actual field enumerations in some sections, expanded field work in general, close contact with producers, and, therefore, expanded personnel. The area basis for commercial estimates appears to offer eventually a higher degree of understanding of the estimate with probably greater practical application.

Greater accuracy and reliability would appear obtainable in an estimate on an area basis through elimination of the element of forecasting economic factors which is a part of the procedure involved in estimating the crop to be produced as fresh fruit for sale, as was done in the past. Estimating on an area basis would remove the unsatisfactory element of sales of fresh fruit from general farm orchards whic h is apparently a difficult point for commercial orchardists in West Virginia to understand. This is in spite of the fact it must be generally known that some 60 to 70 per cent of the trees of bearing age in the State are in "casual" plantings.

Circularization of the orchardists with material illustrating the problems involved in making commercial estimates, and solicitation of their cooperation in making the seasonal condition and percent-of-full-crop reports may have something to commend it. Doing this from both national and state viewpoints, would seem to offer a possibility of obtaining more satisfactory samples and more ready acceptance of the estimates. It might tend to stem any possible insufficiently meditated reactions.

CHECKING ESTIMATES OF FRUIT AND NUT CROPS BY UTILIZATION DATA

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The original use of utilization check data for fruit crop estimates was mainly to place greater stability in gross production estimates. This alone fully justifies the endeavor, although during recent years other uses of these more detailed determinations seem to be claiming equally as much attention. As marketing studies and marketing programs advance, it seems distinctly essential that dependable recordings be made of the main component parts of a gross production. Nearly all fruit or nut crop marketing programs as now operated deal with a special part or parts of a crop that go to some particular market outlet. These segregations are needed in production studies, as well as for price determinations.

If an accounting procedure is followed in developing utilization check data, it is necessary to determine and cover all avenues of disappearance of a crop. How to search out and obtain dependable measures for each of these channels is where the effort becomes complex. Like measures are generally not available for all crops. States of relatively small fruit production will probably afford difficult problems because of the absence of industry groups that often are found to be carefully keeping utilization records for a specific part of the crop. The availability and the type of such check data will also vary among different states because of the difference of varieties produced, different marketing practices followed, and the varied utilization outlets of the crop.

For most of these crops it would seem that four fixed subdivisions might be required, which would include:

Fruit sent out of state for fresh use;
Fruit sold for fresh use within the state;
Fruit processed;
Fruit used on farms where grown.

The first three of these are subject to considerable expansion or subdivision. The increasing requirements for cash income determinations necessitates the earmarking of that amount which was not sold, but was utilized on the farm where grown.

The two items, fruit for fresh use sold "interstate" and "intrastate", may be found difficult to separate. Market News Service carlot movement records are generally most useful in determining interstate sales for states of large commercial production. These records are especially useful in the western states where distances to other states' markets are great and automobile truck movements are limited.

Some coastal states are probably faced with an intricate problem in endeavoring to determine water movement -- coastwise, intercoastal or export -- since there seems to be no satisfactory basis at present to determine the point of origin of some of these shipments that move through the larger ports. Perhaps more ample records of water shipments could be fostered. I am not sure that we now can be certain that Market News records include all such water movements, especially for fruit that is placed in storage before being loaded on the boat. There is also need for more clarity in the export reports of the Bureau of Foreign and Domestic Commerce, if they will fit this need best. At present most of these reports for a commodity list an assortment of packages that are difficult to reduce to a common measure or weight. The variety of packages listed often suggests more a matter of a vague usage of terms than actual differences of packages transported. In these reports there are also the difficulties of detecting trans-shipments.

Rail movement records are becoming increasingly less useful as a check since automobile trucks are carrying more and more of the total volume. For Los Angeles, which is a large fruit-consuming market, during 1937 79% of all perishable unloads arrived by truck, while in San Francisco more than 59% arrived by truck. To the smaller cities and towns within California there was undoubtedly even a larger proportion of the total transported by automobile trucks.

For the past several years the amount of fruit used fresh within California has been accounted for on the basis of per capita consumption through having available the Market News Service unload records for the two largest cities. The unloads are reported for all carriers and are shown on the basis of the state of origin, making it possible to determine the amounts included that were of local state production. This is quite a satisfactory sample, since it happens that the two counties for which these two cities are the distributing points account for one-half of the state's population.

Processing of a commodity may be of different types, and should, of course, be subdivided when this is workable. In some instances processors have actual quantity records of the fresh fruit processed.

A recording of sales by roadside stands may be a useful segregation to include in some states if such amounts can be determined but does not seem to be a reliable factor to consider in California, since so many of those stand operators have purchased and not grown the greater part of the fruits sold, and are in the same class as a grocery store or produce market. Furthermore, we know of no feasible way to obtain such records.

A slightly different but satisfactory method of obtaining utilization check data pertains to a commodity that is largely distributed or processed by one organization, providing that the organization keeps dependable segregated records and is willing to allow such records to be used. When such records for a crop year are obtained, there generally exists some dependable indication that relates the volume handled by the organization to the total state crop. In California the per cent of the state crop so represented is generally a determination from acres

controlled or interstate carlot movement. Two good examples of this type of checking are the use of records of the California Walnut Growers Association in checking walnut production, and of the California Fruit Growers Exchange for checking lemon production.

The alternative method of obtaining utilization check data when the "accounting" basis of checking cannot be followed is by mailed schedules, properly drawn to correspond with the disappearance channels or marketing practices followed for each of these crops. For many of the deciduous fruit crops of California such a schedule survey has been followed for several years. The schedules have been mailed to many growers, not all of whom are regular crop reporters. Tabulation has been carried through on a county basis to determine the per cent utilized in the various channels. These are then brought to a weighted average for a state indication and anchored to a determined item which is thought to be dependable, such as: the tonnage shipped out of the state, or tonnage canned.

These data have been useful, but not entirely satisfactory as compared with the other approach. The sample may be not properly distributed, as certain sections often go heavily to one or two outlets, while other areas may sell mainly for a different utilization. We have also connected a bearing acreage inquiry with the production inquiry. This information converted to a county average yield per acre and in turn to a par yield per acre by counties may eventually be useful. These lists, however, will probably always be too selective as the less efficient operators generally do not return the schedule.

If the schedule method of obtaining utilization data is followed, it seems advisable to circularize these grower lists soon after harvest season has closed. If the "accounting" type check is to be followed and all the outlets are covered, considerable time will elapse before all such summaries are complete and available. In California this check cannot be finished before June 1 of the following year. The dried fruit records become available about that date, and until then there is little dependable information available relative to the dried production. That late date is not convenient for it means that the requirements for the previous year's production revisions, new pars, and the first current forecast for many of these crops all fall within a very few days. This means both a minimum of time for the field man to complete the work and also a minimum of time for the review and consideration in Washington.

In the past we have received good cooperation from the various agencies which help to provide these "accounting" check data. Their interest has definitely increased since the utilization summaries have been included in our state releases. These summaries were inserted on a test basis in 1931, were found to be appreciated, and have been continued since that time. The practice has been to show the utilization summary for the past four years at the date of the first current forecast for the new crop.

DEVELOPMENT OF METHODS OF FORECASTING AND ESTIMATING TRUCK CROPS

M. L. Lowe
Statistician, Michigan

* * * *

Truck crops are extremely sensitive to infestations of diseases and insects, and to weather conditions. Then, too, the truck crop acreage is small in comparison with general crops and is usually localized. It may well be expected that truck crop conditions will fluctuate widely and suddenly, not only between adjacent states but between localities within a state. With these peculiarities in mind, the field men as well as those in the Washington office should disassociate truck crop estimating from methods used on general crops. Conditions and yields of general crops are much more static than those of truck crops. A study of historical data of some of the truck crops shows a much too narrow range of conditions and yields, not always because of facts but because of the conservative influence of the general crops.

Please let me illustrate. In 1934 the yield of Michigan strawberries was estimated at 50 crates per acre, the lowest yield in many years. The yield was not revised until the census data was summarized, which showed that the yield was 22 crates per acre. Probably the yield would still be carried at 50 crates were it not for the census. Last year (1937) the Michigan strawberry crop was the largest in history. I estimated the yield at 110 crates per acre, the highest yield since 1919, and maybe for all time, and I still think the yield was at least that much, yet the final figure released from the Washington office gave the yield at 90 crates. To my mind, this is an example of the general crop influence toward conservatism which, more often than not, will result in inaccurate data.

Now a word about estimating truck crops. Field travel is the most important and dependable method of estimating conditions and yields, provided, of course, that the crop estimator is given sufficient time to cover the area. Since most reports are submitted as of the first of the month, the field work should be divided so that about the same amount of time is spent before as after the given date. If possible, such trips should not exceed two weeks. In some instances, crop conditions will make radical changes within the two weeks interval. In that case, farm schedules would be of great value in spotting these changes. To my mind, the itinerary of the crop estimator during the growing season should allow two weeks travel per month for making monthly reports, one week in the office and one more week in the field to give certain areas a more thorough check.

Truck crop estimators should have more than an academic acquaintance with crops and should have an inherent interest in the production and marketing problems of the crops covered. Farm psychology must be

understood and practiced in order that the information sought will be given freely and in order that future contacts will be welcomed by the farmer.

Since speed is essential in order to cover the areas in the shortest possible time, it becomes necessary to make a limited number of contacts in the various localities. As a rule there are a few men in each section who can be depended upon to give reasonably accurate information. Opinions of these key men must be given serious consideration in formulating crop estimates. Individual farm data of the key men should be used also. The estimator's own opinion should be arrived at by his own observations and should be independent of the opinion of others. I find it expedient to visit a sufficient number of fields in each area in order to get a weighted condition figure which will be applied to par production in estimating yields. I usually record my own opinion of the general condition of each area without the use of the weighted data mentioned above in order to check my own observations against the weighted indications and opinions of local men.

In some cases it becomes evident by January 1 that current onion and potato estimates should be corrected as indicated by carlot shipments to that date and the stocks on hand. Growers and dealers want reliable data for the current marketing season, and to justify our work we should give them this service. Since potatoes and onions are speculative crops and since the January stocks reports are very important to the two industries as an aid in formulating marketing plans, we should have the opportunity to make changes in the current estimates, not only for the sake of the industries but to maintain our own place in the sun as well. The carlot movement of onions from Minnesota to January 1 this past season plus the storage holdings on January 1, indicated that the estimate for that state was too low by possibly 500 cars. The proper time to have made this revision was at the time the need first became apparent and that was surely on January 1, not next year nor five years from now. Let me give you an example of delay in making revisions:

1929 INDIANA ONION CROP

Estimated production	5,536	cars	
Total carlot shipments	5,195	"	94% of crop
Shrinkage, local sales, trucked	341	"	6% " "

Storage holdings (Jan. 1) original estimate	1,661	cars
Carlot movement after Jan. 1	1,829	"
Revised holdings (following year)	1,827	"
Revised holdings (1938)	1,952	"

It is very apparent that the production estimate was too low by 1,000 to 1,500 cars, yet no revisions were ever made. The storage stocks were revised on two occasions but it seems evident after a lapse of 9 years that the revised stocks are still too low. As indicated by the monthly L. C. L. onion prices in Chicago for the 1929 crop,

growers received 41% more for onions sold from the field in September than was received out of storage in March. What caused this sag in prices? Did the growers who held onions until March do so on the strength of the crop estimates? Were the estimates too low? Did the over-shipment of the Indiana crop cause a bearish influence on the market? Should we be concerned with the economic outcome of a crop in which our estimates play such an important part? Some of these questions cannot be answered, yet the last questions must surely be answered in the affirmative.

TRUCK CROP YIELDS

G. L. Morgan
Statistician, New Jersey

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The problem of estimating truck crop yields is somewhat different from that of general crops. They are all cash crops and reports and liable to contain considerable bias, and also the chance of error is magnified several times by the use of a variety of containers. This is true not only between States but in counties and crop areas of the same State, there are from two to five different packages in common use for each commodity in New Jersey. For this reason the Bureau of Census uses values instead of yields and production of truck crops, and perhaps it is fortunate for us that they do. In New Jersey we send out two schedules to obtain truck crop yields, one at the end of the harvesting season for each crop, and another at the end of the year to a separate list asking average yields and average prices received for all crops.

The average spread between these two reports runs from one to five per cent. There does not seem to be much relationship between condition reported at the beginning of the season and yield reported on either of these schedules. In trying to fit a curve to charts made up from these data for forecasting yields, we find ourselves in much the same position as a blind man in a strange closet trying to find something that is not there. The reason is that in New Jersey truck crops are mostly grown on light soils and are much more sensitive to weather changes than are the more deeply rooted crops.

The curves do improve to some extent, however, as you get nearer the harvesting period. We have for the past seven years carried canning tomatoes on our acreage and production schedule, but as far as I can see, this type of inquiry is no great improvement over the judgment schedule.

I believe field work is absolutely essential in making estimates of truck crop yields.

By personal visit to a greater number of growers we are able to get a more representative sample, be sure of the container used, find out if they are reporting on their entire acreage, if they are including all grades, and get much more desirable data not obtainable by any other method.

THE USE OF FIELD CONTACTS IN TRUCK CROP ESTIMATES

Carl M. Schiller,
Statistician, California

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The estimating of truck and melon crop acreages has perhaps been looked upon by many state offices as a chore to be done, and because of limited information upon which to base estimates, one which is not very popular. To some it is discouraging to work crops that won't readily fit the tried and accepted procedure; crops that are irregular in their behavior; crops that are here today, gone tomorrow; crops that promise big returns one day and a week later, nothing. It's discouraging to work with the growers of those crops, many of them foreign-born, who haven't much of a grasp of the English language, and who are not given to returning adequate inquiries; growers with small acreages, the sum total of which do not make much of a dent in the state's agricultural acreage. However, these self-same growers are producing enough, and, in many cases, more than enough vegetables and melons to feed a nation. The average per acre return puts most crops to shame, and the total value represents a considerable portion of our national farm income.

In the western states, individual vegetable acreages are probably larger than those elsewhere in the United States but they are not stable. The grain grower today is a pea grower tomorrow, with a thousand dollar advance in his pocket and a truck load of seed by the barn. A lettuce grower may continue a lettuce grower for some time, but not on the same land nor in the same district. New districts are coming in, old ones going out. Districts that have planted a few acres one year broaden into hundreds the next, and reduce just as fast. Vegetables are exacting on soils, and a great deal of the western produce is on leased land. The production of vegetables and melons is a business -- a gambler's business, one where the stakes are high, profits large and the losses heavy. Time is of vital importance and decisions are made overnight. Thousands of dollars are spent planting or bringing a crop into production, trying to out-guess the other fellow by having a crop available during a short period of scarcity.

There are two questions about competing sections invariably asked by vegetable growers. The first one concerns acreage. The second, and more important to them, is "When." Just two questions: "How much?" and "When?"

From a Crop Estimates angle, vegetable estimates are like Topsy, they "just grew up." We have attempted to handle them under a standard procedure which has been fairly successful on other major crops. An article on western farm machinery came to my attention the other day and I would like to quote a portion of it. Speaking of the development of western power farm equipment, it said: "One of the most exasperating

problems of western agriculture was the misguided notion on the part of the eastern manufacturers of farm machinery that western agriculture, even though an irrigated agriculture, should choose its cultural needs to fit equipment designed for eastern growing." The Crop Reporting Service has been trying to cultivate truck crops in the same way. We are using tools or methods of estimating that were not designed for truck crops and expecting to do a good job even though the tool doesn't fit. Why? Because one or two standard brands of cotton or corn cultivators are handy and we haven't had the time or money to really study the problem and build one that will do the work for truck crops.

Have I a solution? No. My time has been spent in keeping up with the program rather than inventing a new machine to do the work. However, I can tell you some of the essential features that are needed in this new streamlined cultivator for truck crop estimates, and the first and most important of these is speed. Truck and melon crops are by nature one of our fastest moving commodities. Two and a half months after the seed is in the ground, the crop is being harvested. Vegetable crops are alive; they are moving fast, and to keep up with them Crop Estimates must move fast. That means rubber tires on the cultivator, rubber tires inflated with travel money -- not a whole lot, but enough to get out into the producing sections, meet and make contacts with key people, people who can tell you what's doing as well as what has been done. Second, in order to get information we must give information. And I suggest that on this new cultivator we pay more attention to a clear windshield and the row ahead than we do to the rear view mirror and the row behind. If we can give up-to-the-minute information, we will find plenty of live-wire operators who will play ball and help us to get that type of information. Third, along with this cultivator we need some hand hoes to get into the corners, and for the small patches. There are some states where acreages are not large but very important in the marketing programs of these crops. The lack of reliable information from these areas has been one of the biggest handicaps in the truck crop program. Fourth, I suggest that we free up the steering gear of this cultivator. In traveling toward our forecasts, perhaps we have dual steering, but use the old "condition" lever as a secondary instrument and not place complete dependence upon where it takes us in its slow, roundabout way. A knowledge of the districts, together with the opinions of well-informed people on yields and crop possibilities furnishes a shorter cut.

And while I speak of condition as a base to forecast crops, let me say that we have, I believe, fairly accurate data on the acreage and production of crops by counties in California for the past 12 years. These records have been checked by utilization and are as complete as we can make them. Our yield figures have been checked back against the growers' at harvest time. We have weighted each county's reported condition to arrive at a state figure and yet most of these condition charts look like they have been made with a shotgun at 50 yards.

On the 8th day of March we mailed vegetable growers approximately 750 schedules, asking for the condition and price of 18 crops now growing within the state. We had 88 usable returns. By crops, carrots led the list with 24 condition reports, of which 11 were in districts carrying a

weight. Peas came next with 16 reports, 12 of which we were able to weight. Spring peas in California represent plantings on 40 to 50 thousands of acres of land and a crop value of between three and four millions of dollars. Of the 18 crops listed on the schedule, 6 crops returned 5 or less reports on condition and not all of them from sections where we could apply a weight. That is why I suggest we adopt a new steering gear.

We are interested in forecasting crops by schedule or any other workable method that will make things easier and give us dependable results, and we are still trying to make this condition method work. But in the meantime we have been forced to travel, and California is a big state with commercial vegetable areas extending along the coastline for approximately 750 miles, and another 700 miles through the interior of the state. On some crops we actually survey the acreage, but we have been forced to depend upon key men in most areas for our information; men who represent shippers, seed houses, irrigation districts and railroads; men who are living right with these crops and whose bread and butter is in the handling of them. These men don't write letters nor do they answer schedules. They are, however, always willing to talk and trade information. As time has gone by, we have weeded out the less reliable, or those who wouldn't give as well as take. We have found that these contacts give us a broader view of conditions in a district than can be obtained from the individual grower, and we get it faster, but it means a lot of hard travel.

We realize that our methods are not up to the approved statistical approach, but we have over half a million acres in California vegetables and we are reporting on 45 different crops and trying to keep track of a dozen more. Our problem has been and is to get the job done, and we have had to short-cut for the sake of speed. The use of field contacts has been our solution.

Vegetables are a big business in this country. They are an important factor to our railroads, our truck and farm machinery manufacturers, the lumber industry, paper mills, and a long line of manufacturers that tie directly into our national life.

If the Division of Crop and Livestock Estimates, by the addition of a little streamlining, some rubber tires, and faster vision, can bring our estimates up to where they can show this industry that they can do the job and do it fast, I believe that the industry is big enough and represents enough power to demand that our truck crop gas and oil bill be paid.

FIELD OFFICE MANAGEMENT AND PROBLEMS

D. A. McCandliss,
Regional Statistician, Southern States

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Maintaining efficiency in any field office is a difficult and complicated problem. It is also difficult to devise an equitable measure to use in comparing the relative efficiency of the different offices. From an administrative standpoint such comparisons are needed not only to locate offices where efficiency is low, but also to find those where improved methods have been developed which could be used elsewhere.

As a crude basis for making such comparisons a study has been made of the average cost per schedule of handling some of the regular inquiries in the different offices. Other factors than efficiency greatly affect these costs, but the results of the study are interesting and may give some ideas that eventually will help us do our work better and easier.

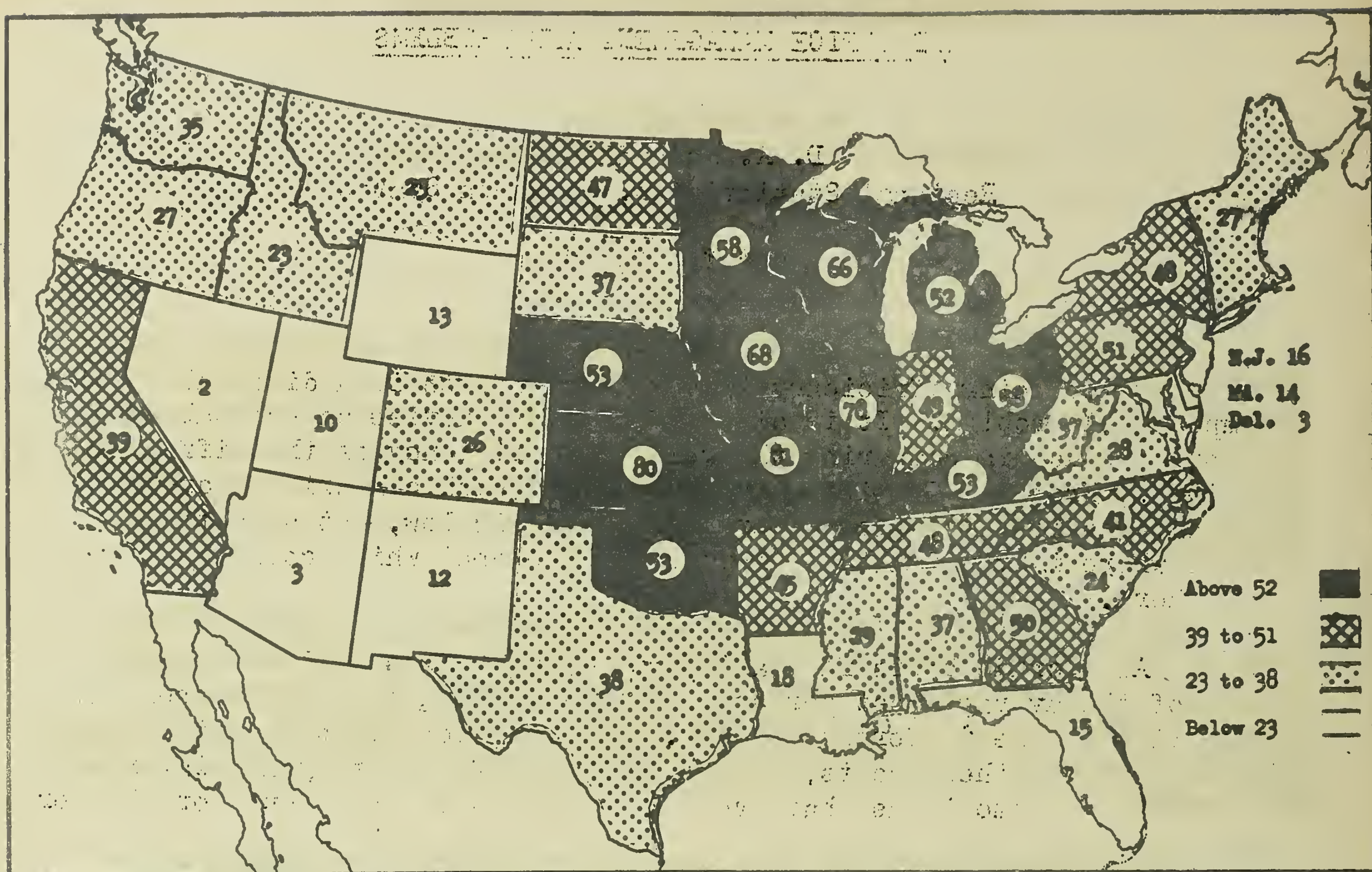
The average costs per schedule were computed by dividing the total cost for various projects in certain months, as reported on the monthly cost records, by the number of schedules listed for those projects. Federal and State costs were combined, and charges for travel were deducted. In studying the costs of the General Schedule the totals for several months were added in order to eliminate minor variations from month to month.

The results of two of these studies are shown on Plate 7. The wide difference in costs between states is immediately apparent, and one wonders why it costs so much more in some states than in others to handle the same inquiry. This is not easy to answer because relative efficiency is only one of the factors involved. Before drawing conclusions from Plate 7 one should study carefully all the various factors which affect these costs.

Generally speaking it costs more per schedule to handle a small number of returns than a large number. The reasons for this are rather obvious. On Plate 1 the upper map shows the number of General Schedules listed in each state from January to June, 1937, and comparison of this with the upper map on Plate 7 shows rather general similarity. Costs are usually low in the states which handle the most returns.

The upper maps on Plates 2, 3, 4 and 5 show the numbers of returns from various other inquiries in 1937, and these are summarized on Plate 6. The general pattern of all these maps is similar, and the summary on Plate 6 brings out quite clearly the fact that geography is reflected in the numbers of returns. With a few exceptions the largest

GENERAL SCHEDULES, January - June, 1937: Number of Schedules Listed (00)



GENERAL SCHEDULES, January - June, 1937: % Returned

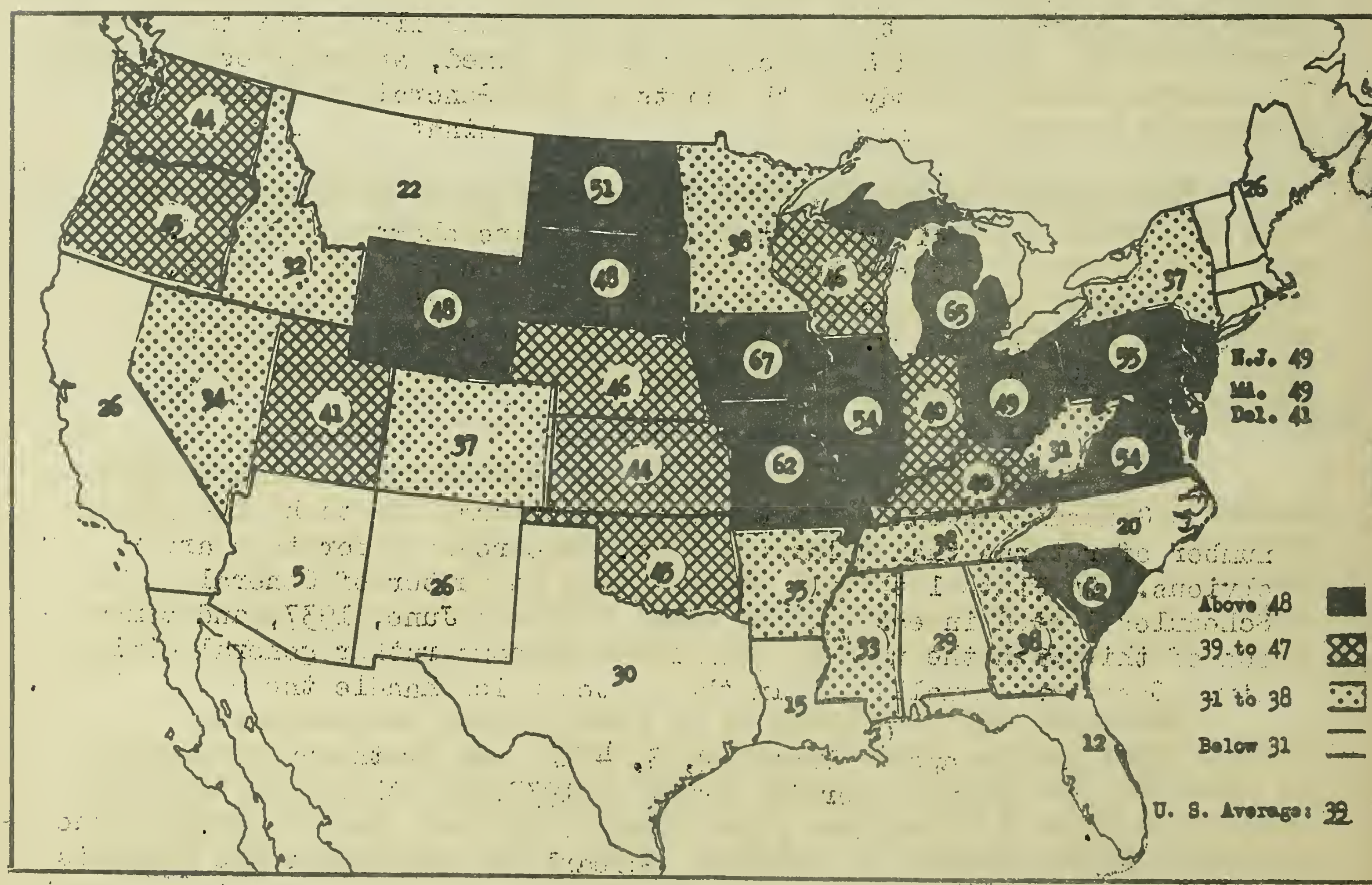
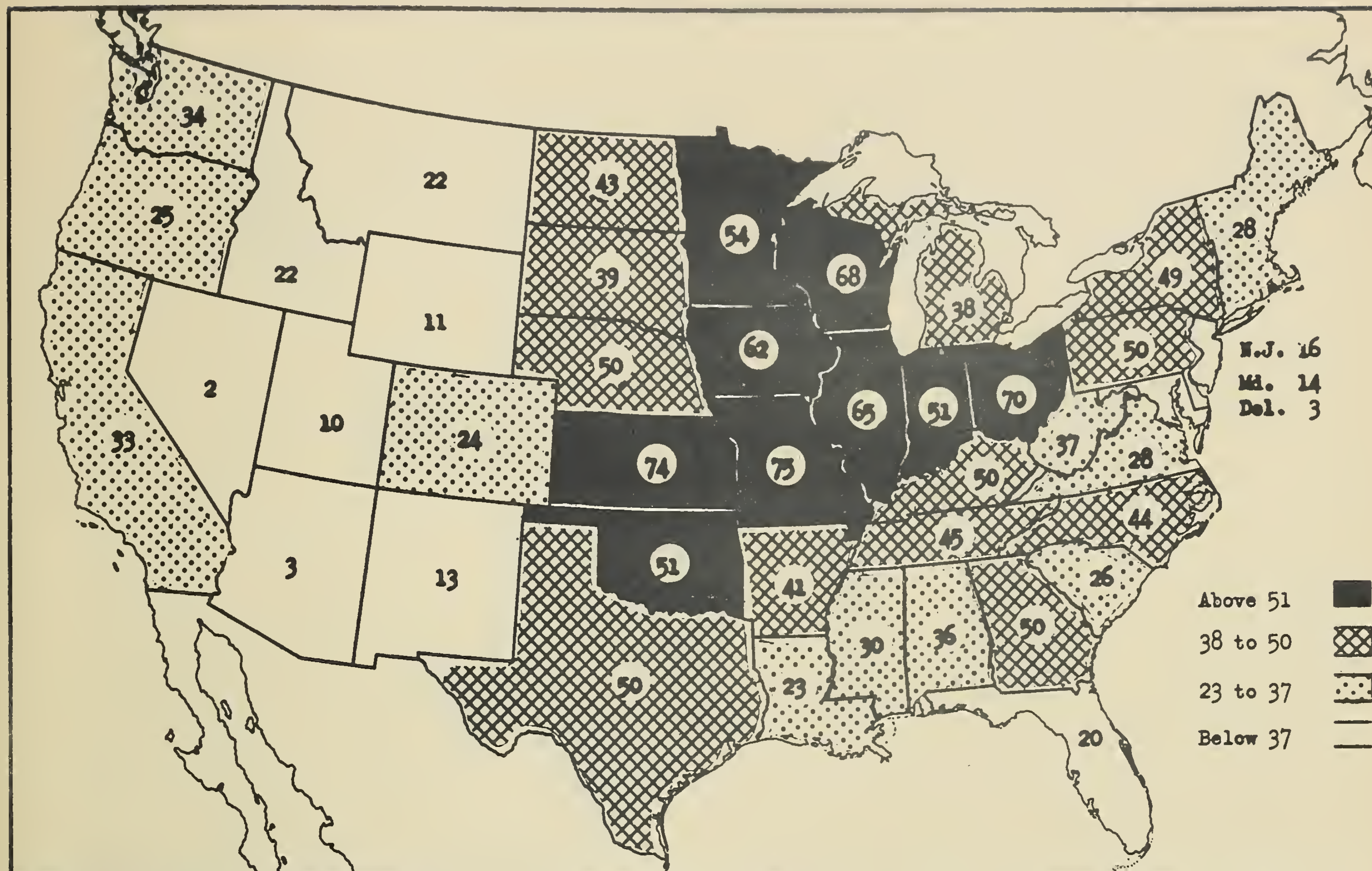


PLATE 2

GENERAL SCHEDULES, July to December, 1937: Number of schedules listed (00).



GENERAL SCHEDULES, July to December, 1937: % Returned

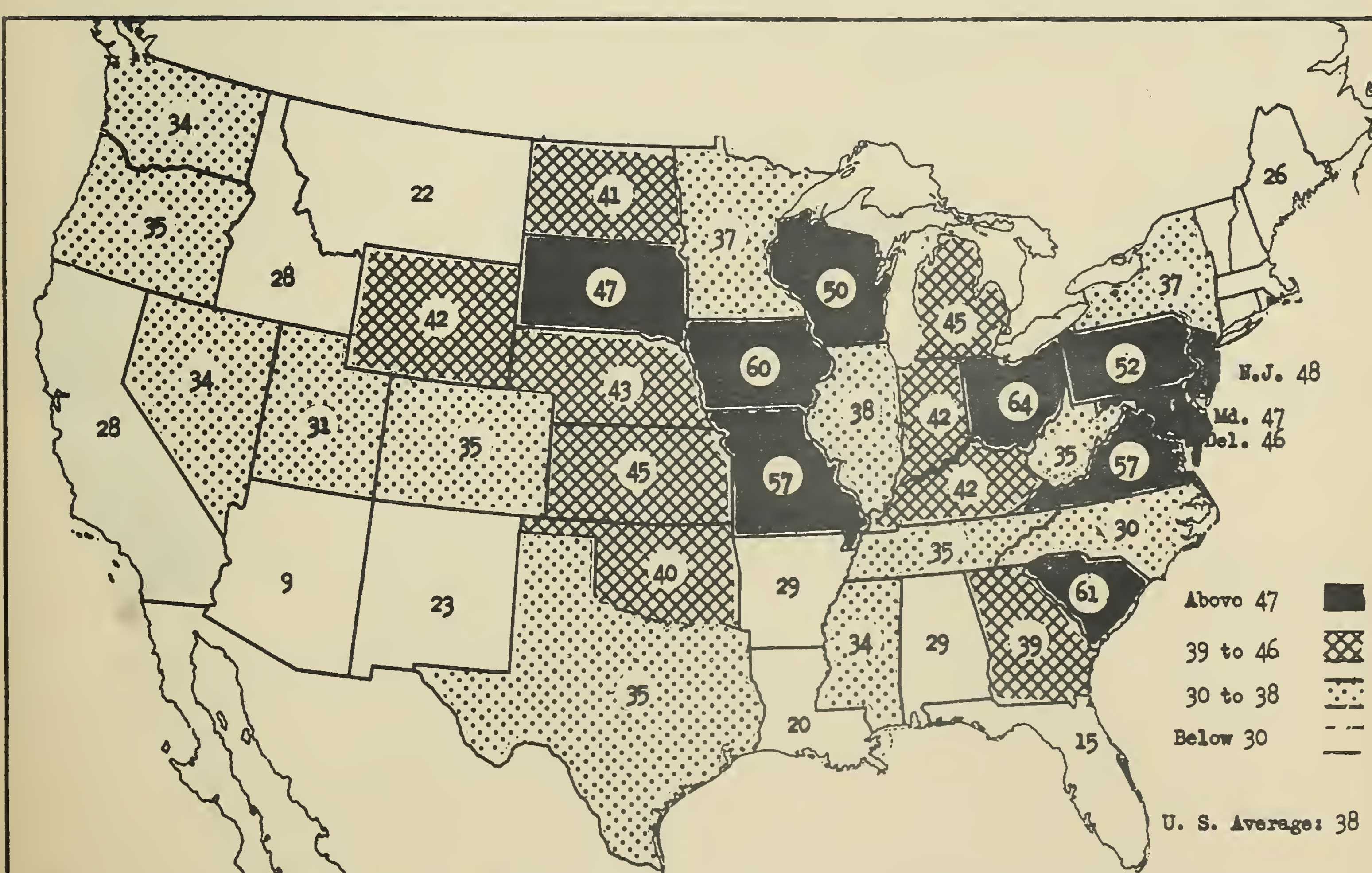
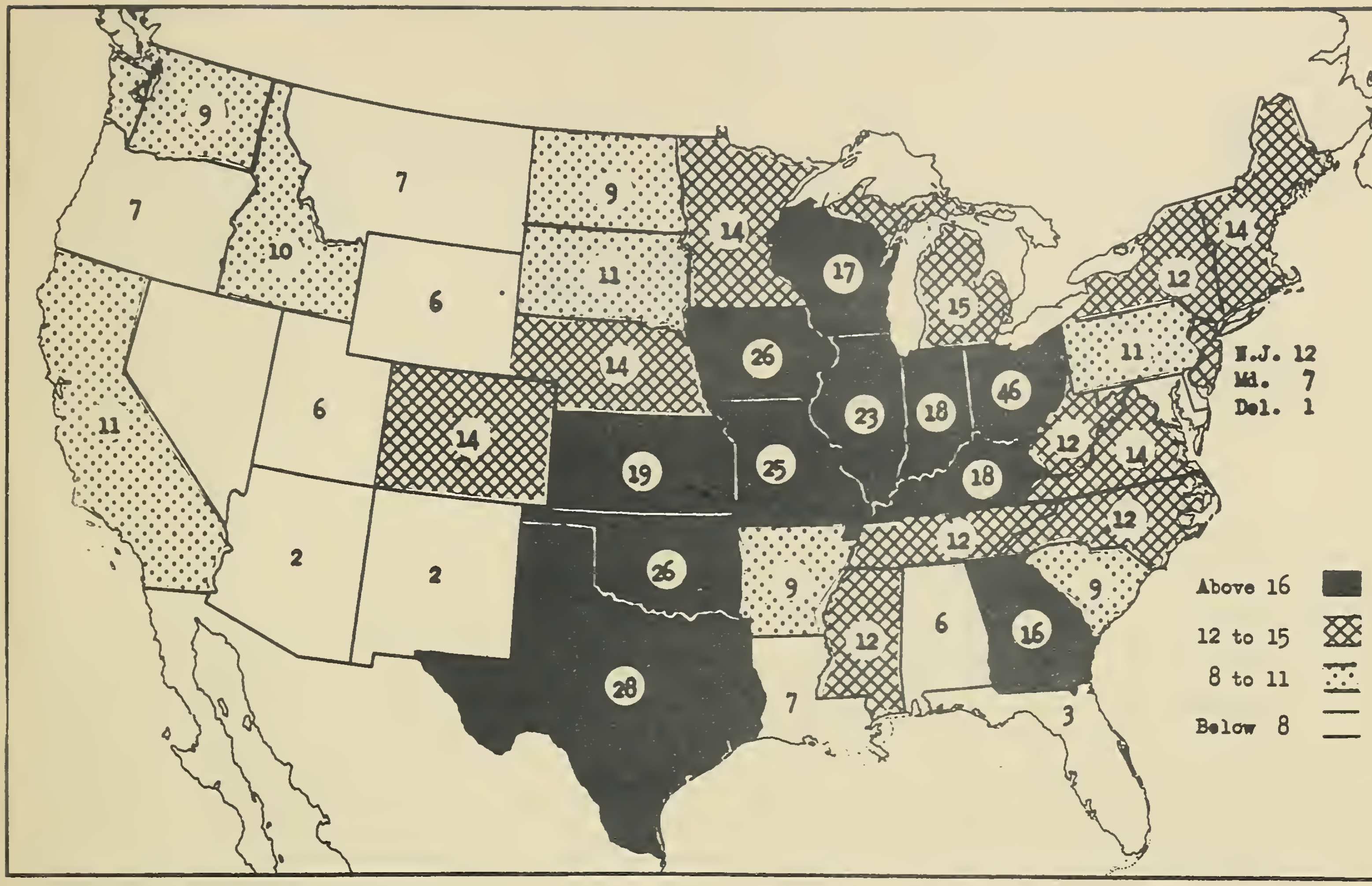
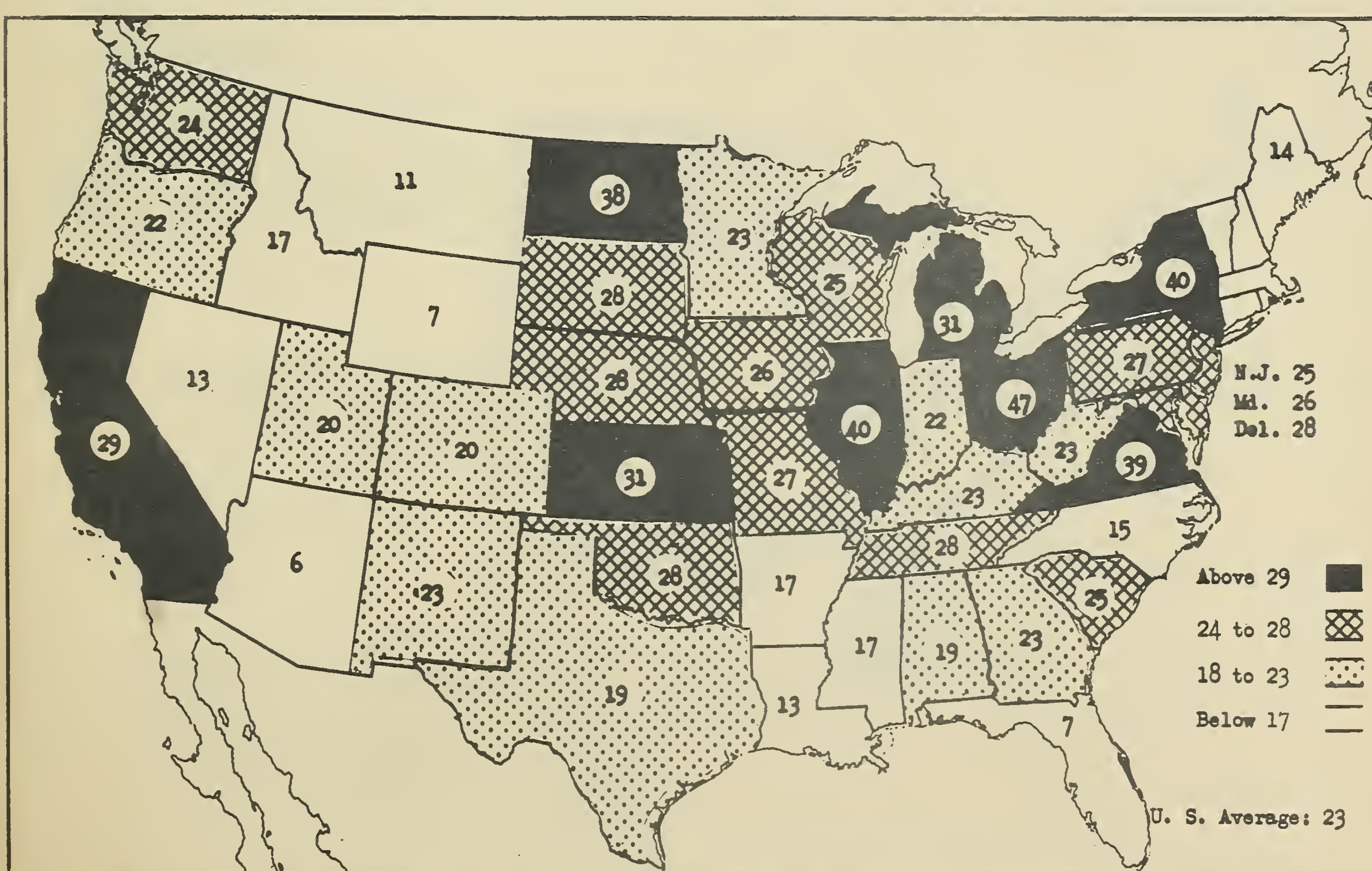


PLATE 3

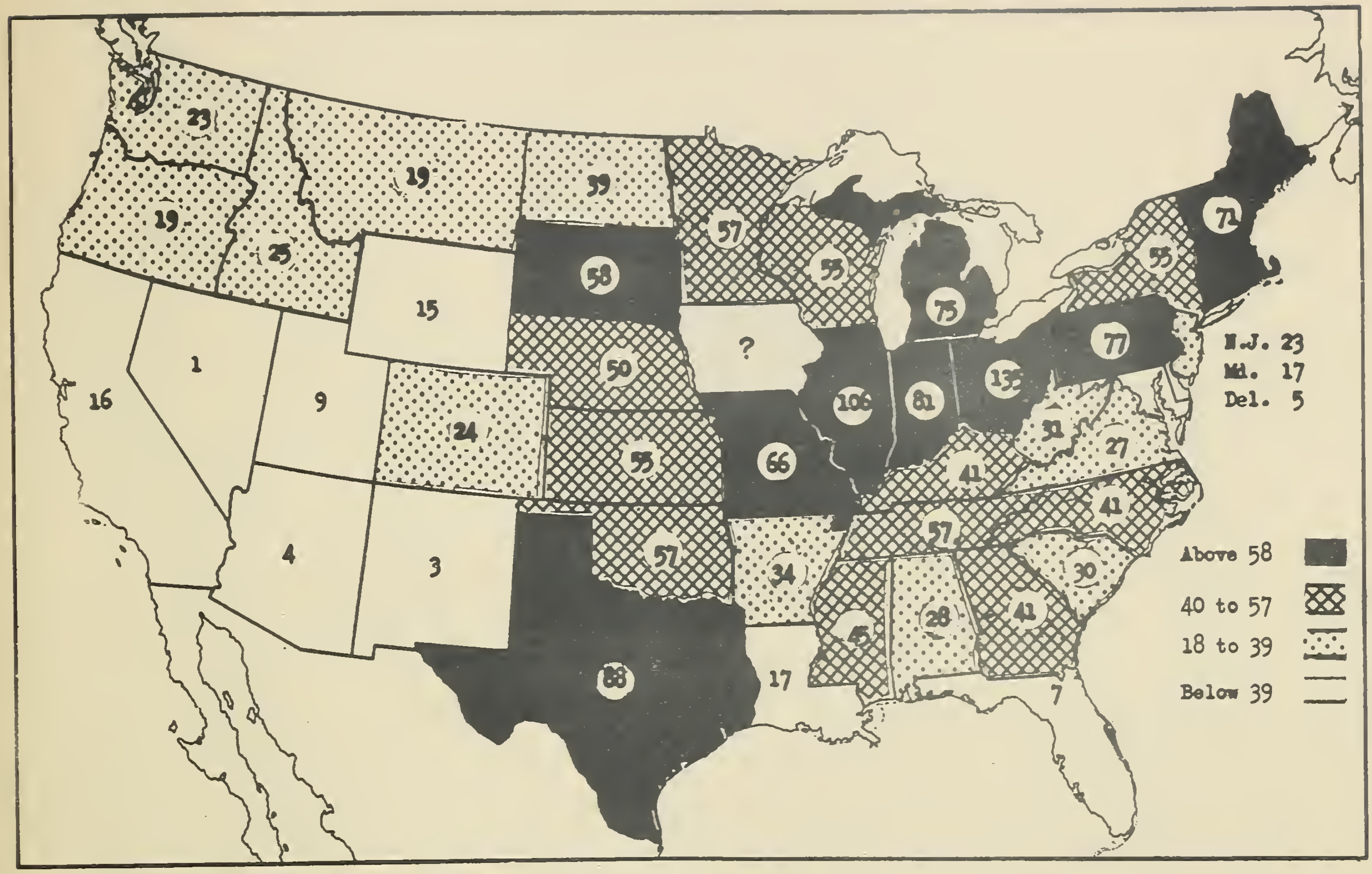
ACREAGE SCHEDULES, March, 1937 Number Listed (00)



ACREAGE SCHEDULES, March, 1937: % Returned



RURAL CARRIER ACREAGE SCHEDULES, September, 1937: Number listed (00).



RURAL CARRIER ACREAGE SCHEDULES September, 1937: % Returned

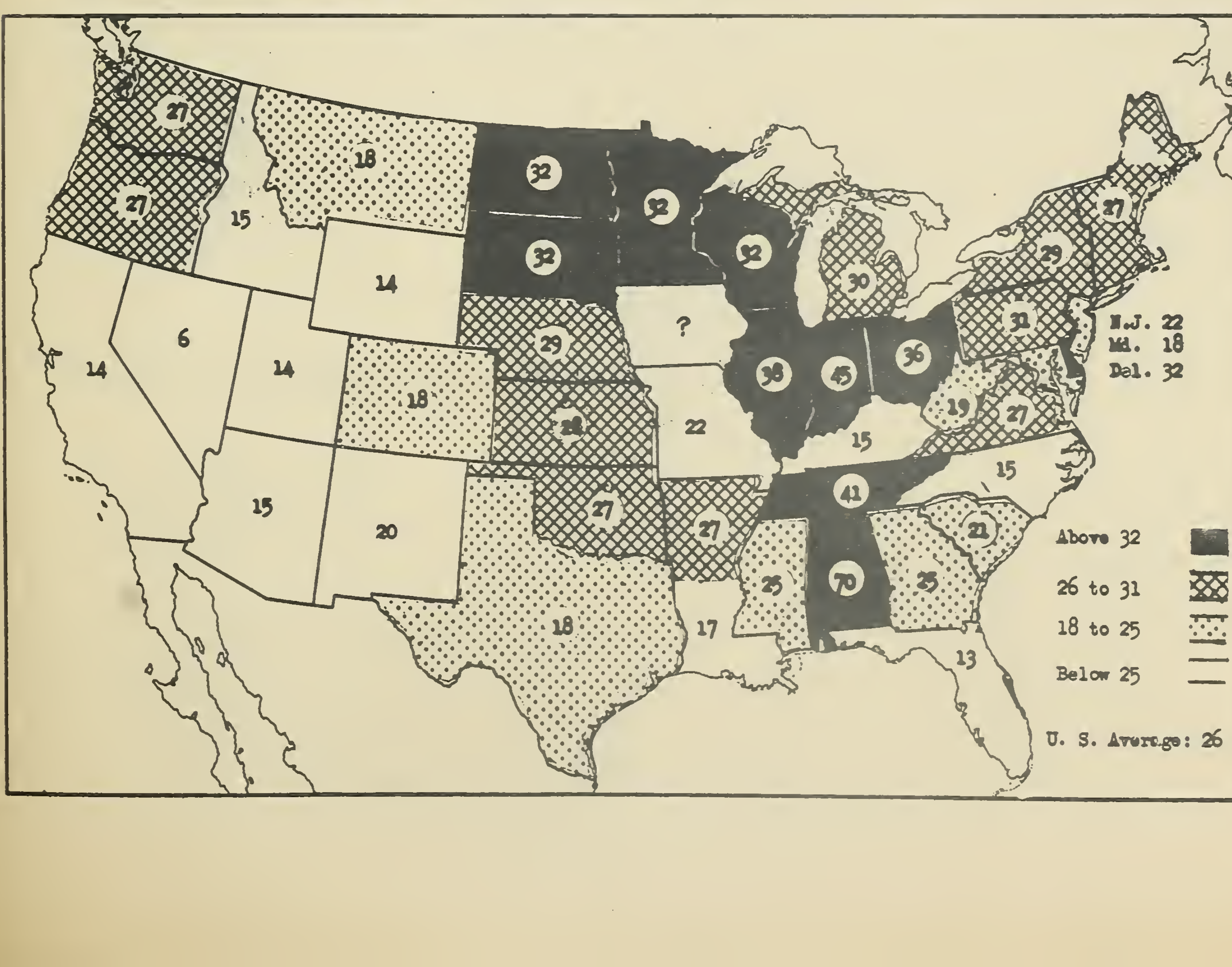
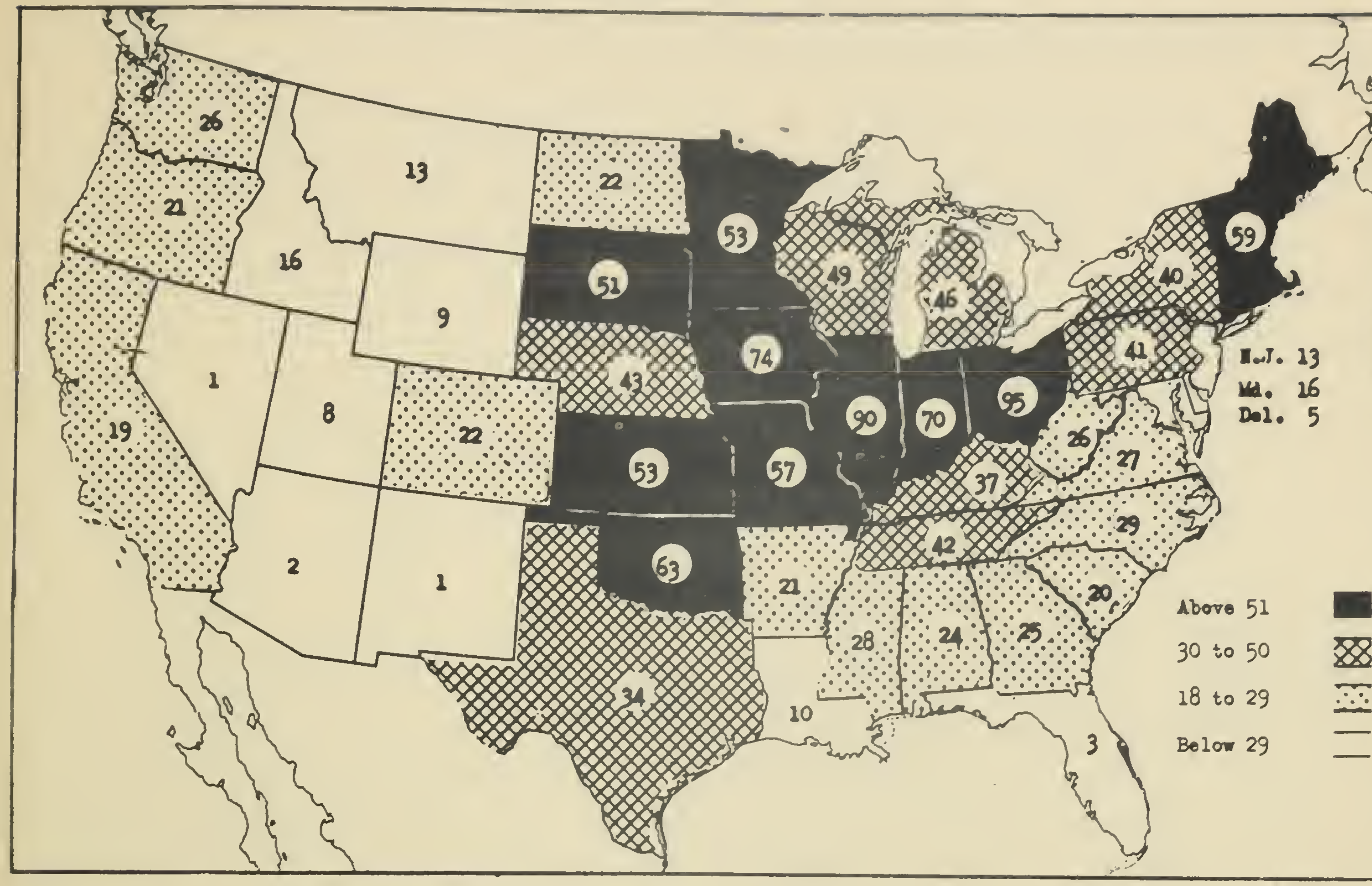


PLATE 5

LIVESTOCK SCHEDULES, December, 1937: Number listed (00).



LIVESTOCK SCHEDULES, December, 1937: % Returned

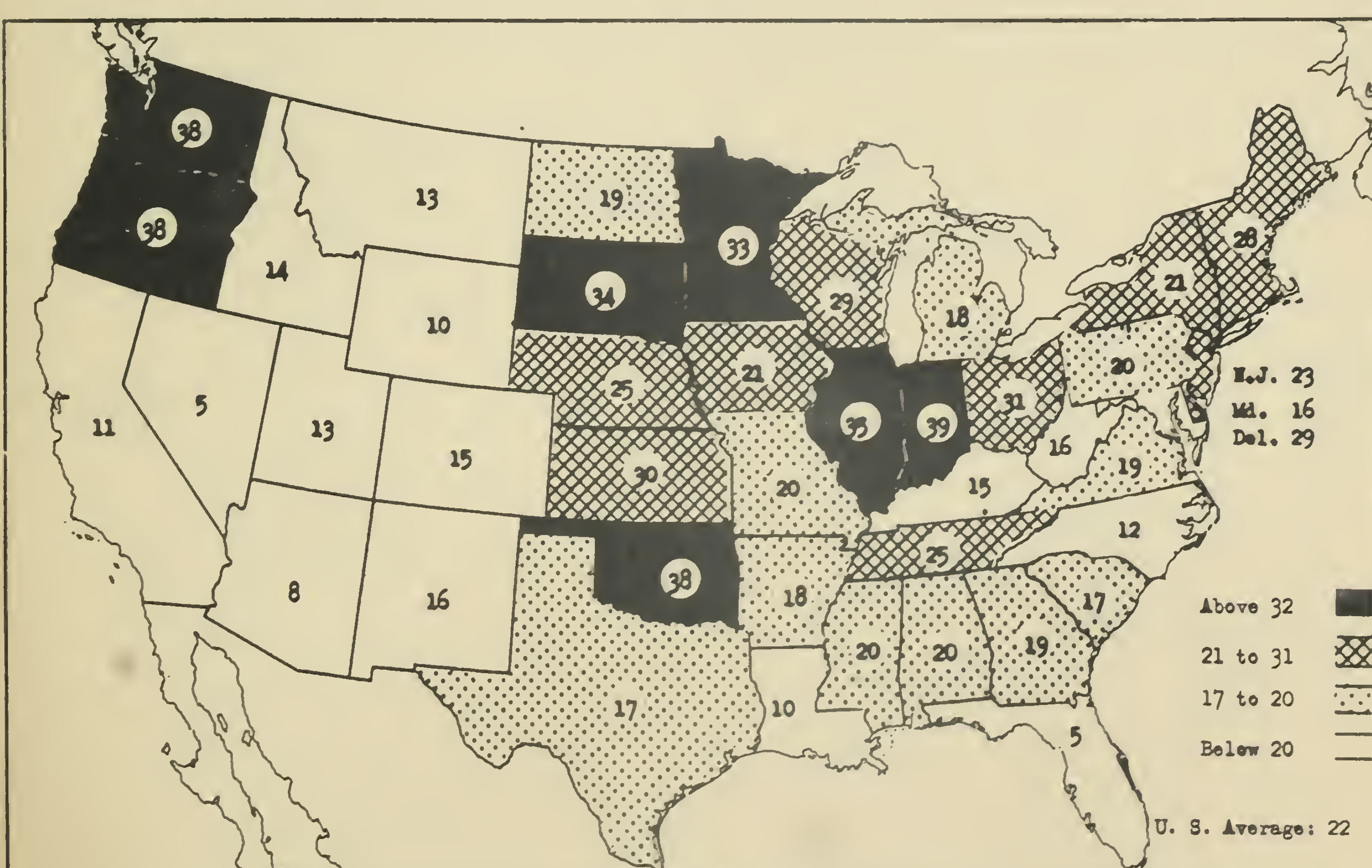
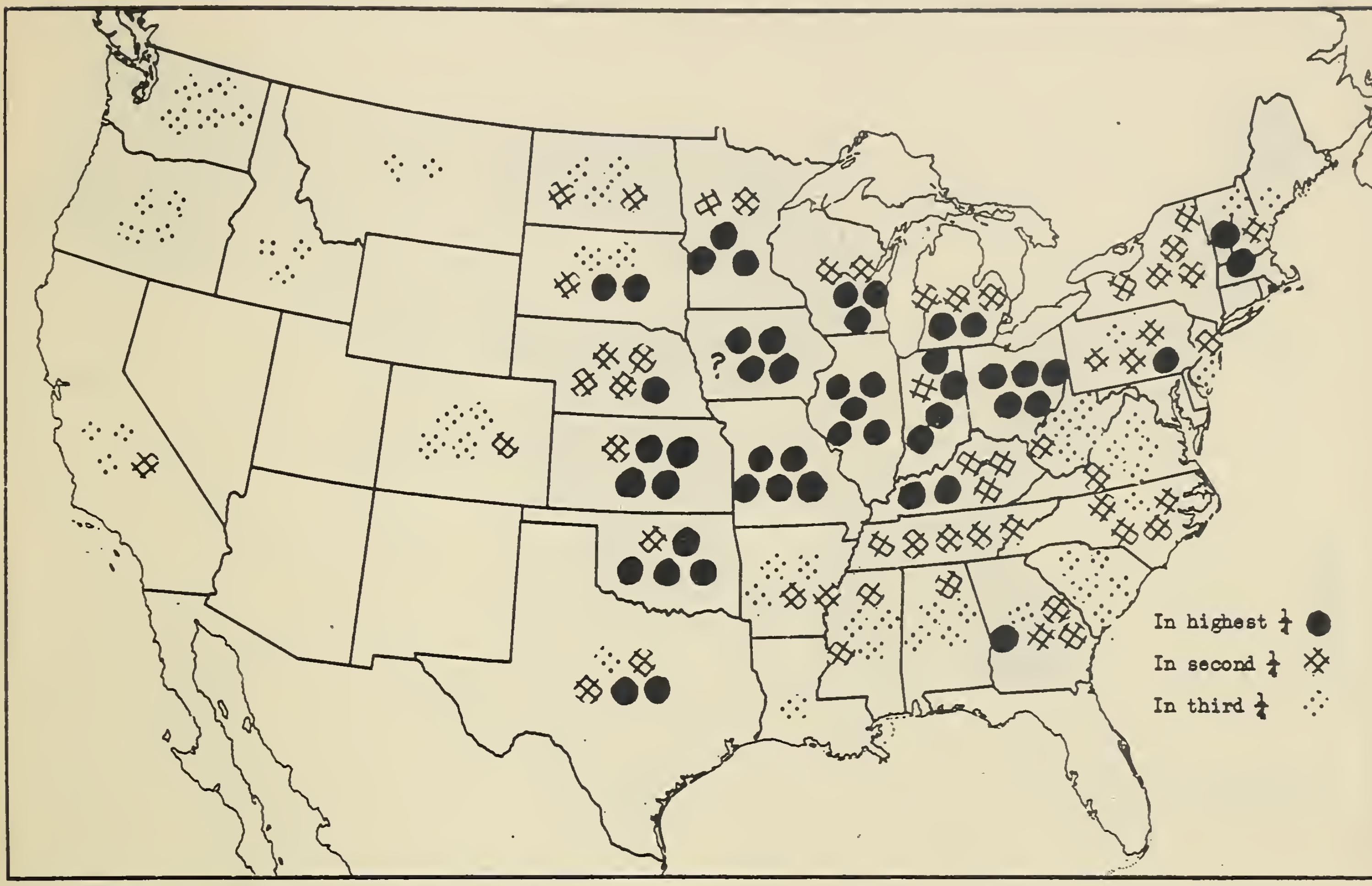


PLATE 6

SUMMARY, PLATES 1, 2, 3, 4, & 5: Numbers of schedules listed.



SUMMARY, PLATES 1, 2, 3, 4, & 5: % of schedules returned.

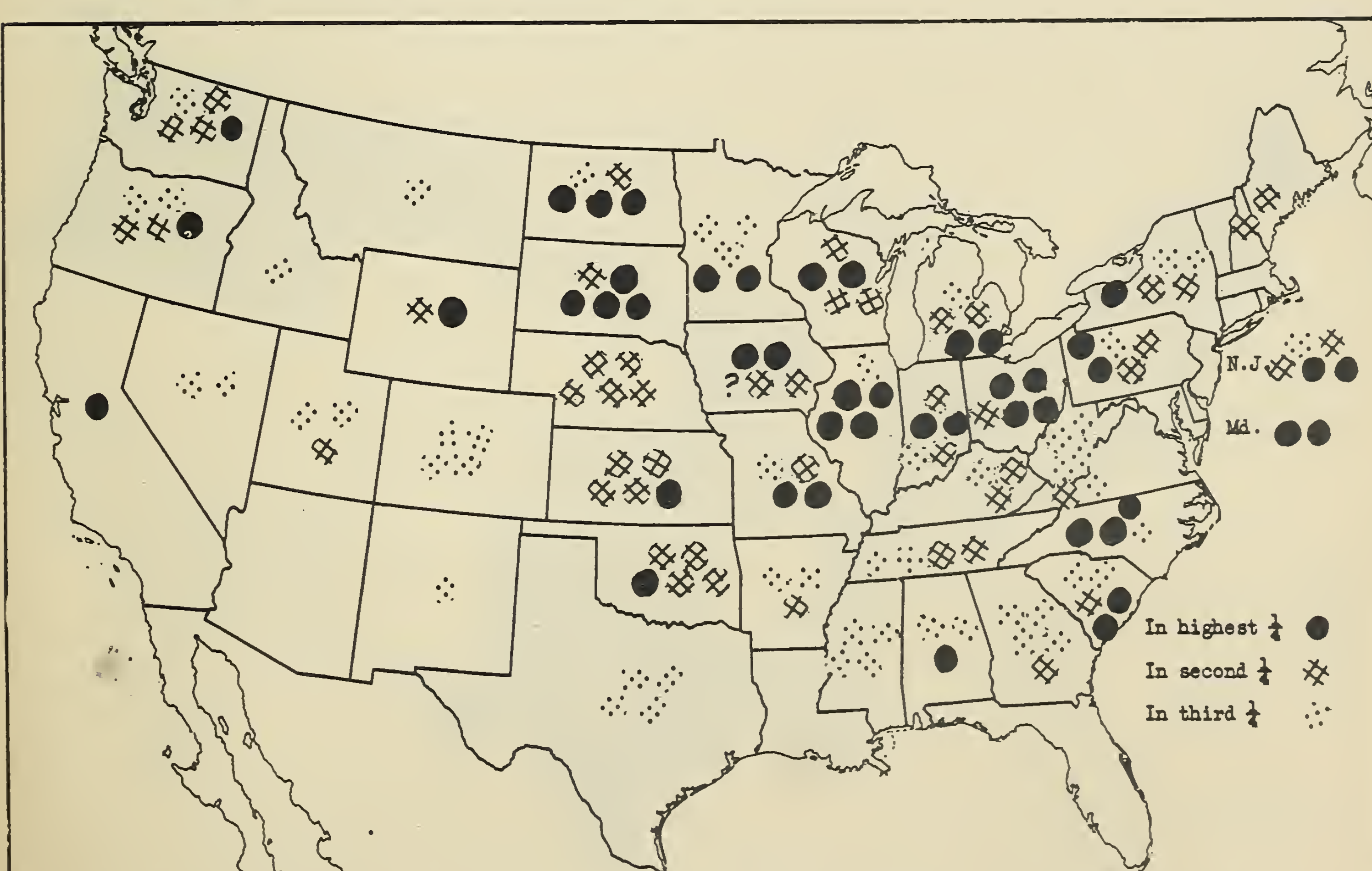
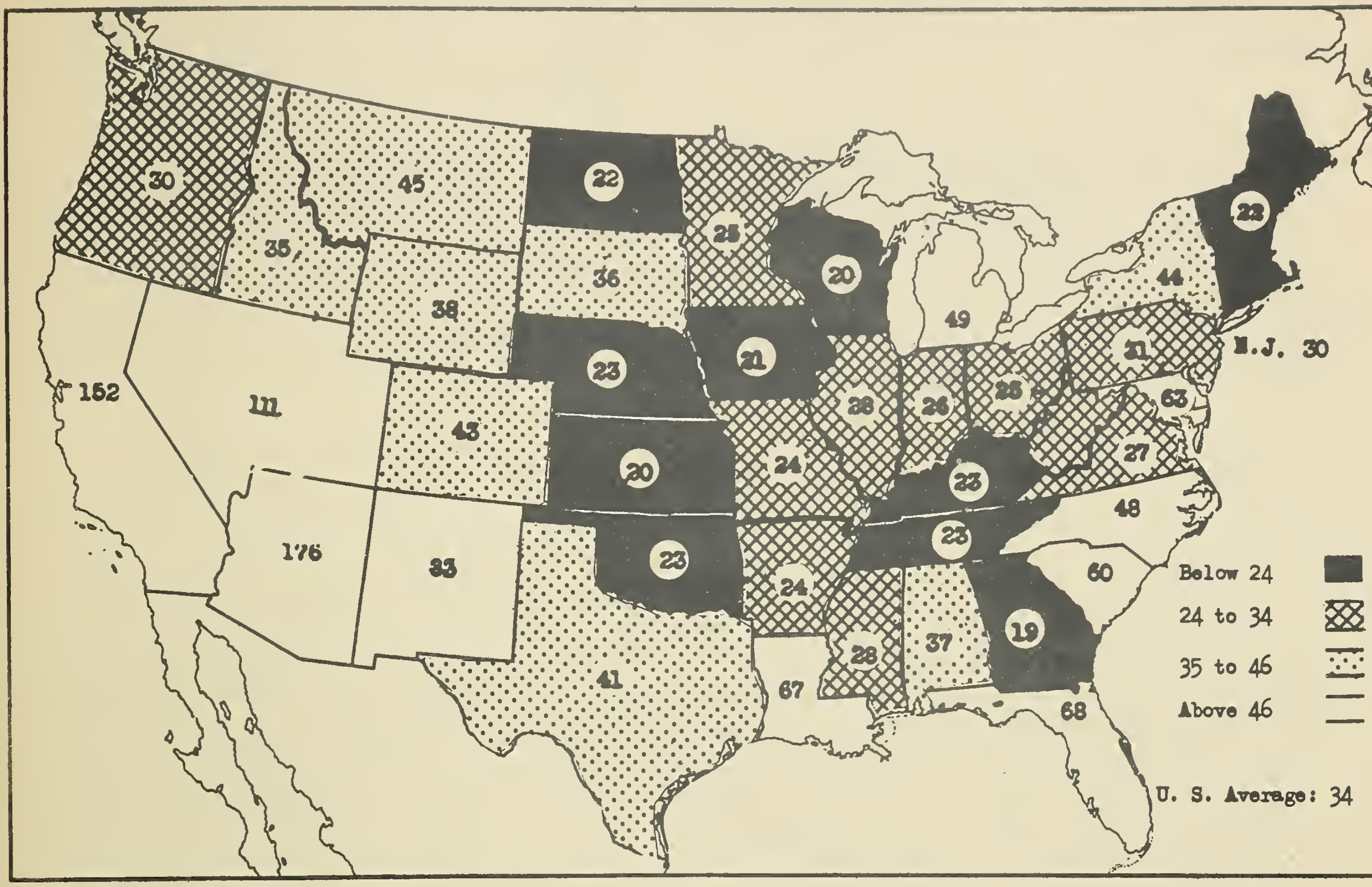
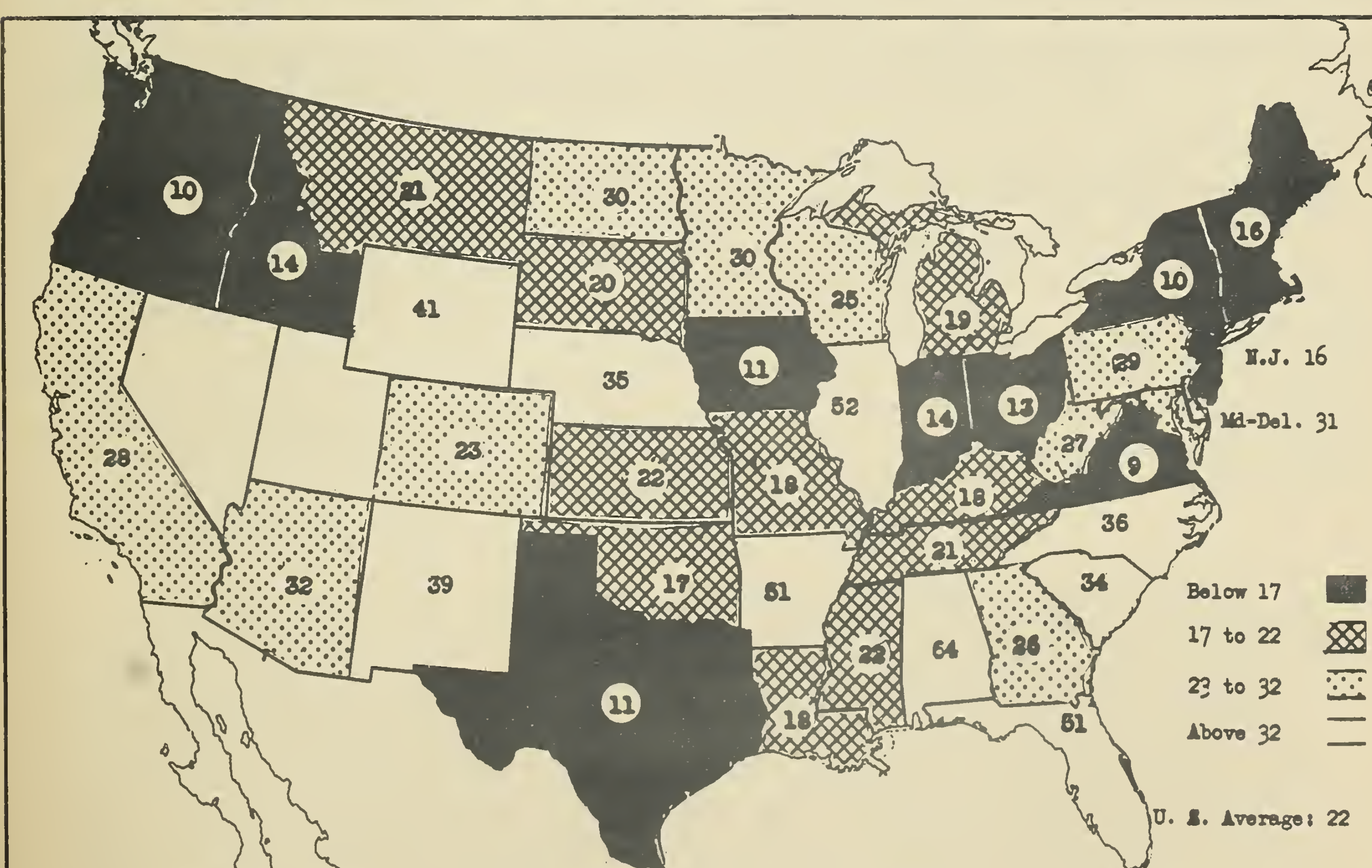


PLATE 7

GENERAL SCHEDULES, January to June, 1937: Average cost per schedulelisted (¢)



ACREAGE SCHEDULE, March, 1937: Cost per schedule listed (¢)



numbers of returns are obtained in the Corn Belt and the adjoining western states. The Southern and Eastern regions bring in fewer returns, while the Western Mountain States obtain the smallest numbers. This is what would be expected, considering the relative density of farm population and other factors involved.

The map showing costs of the General Schedule (upper, Plate 7) shows the same general pattern as the summary of numbers of returns (Plate 6). This helps to explain part of the variations in costs, and brings out the need for keeping geographic factors in mind in making comparisons. This does not explain all the differences in costs, however, and some states which would seem to be fairly comparable show rather wide differences. We need to look for other factors which also affect costs.

One of these factors is the per cent of the schedules returned from those sent out. It is clear that if no returns at all came back from an inquiry, the cost of making it would be a complete loss. Likewise, a low per cent return increases the average cost of those schedules which are returned. On Plates 1, 2, 3, 4, 5 and 6 the lower maps show the per cent returns on the same inquiries for which the numbers are shown on the upper maps. These maps indicate that geographic influences have an effect on per cent returns, as well as on total numbers, but the relationship is not so marked. The differences in per cent returns between some states that should be reasonably comparable might indicate that lists are kept in better shape in some states than in others. Comparison of the maps on Plates 1 and 3, with the corresponding cost maps on Plate 7, shows that relatively low costs are often associated with high per cent returns, even in states where the total numbers listed are not high. This is only true within reasonable limits but there would seem to be a chance to improve efficiency by increasing the number and per cent of the schedules returned, by careful work on the mailing lists.

This is no easy job. It is obvious that it would be quite possible to obtain high per cent returns by rigidly eliminating all but the very best reporters. One objection to "weeding out" too drastically is that the total number of returns may be reduced too much. Furthermore, the elimination of all "occasional" reporters would increase the selectivity of the list and reduce representativeness, and would also reduce comparability with reports for previous years. On the other hand, when a man refuses to report for a year or more, and fails to respond to any encouragement or appeals, it would seem to be a waste of time to keep on sending him schedules and reports. The time might better be spent in hunting up somebody else who really will report.

I am sorry I cannot give any new and brilliant easy methods for maintaining lists of reporters. Many plans are being used in different offices and most of them are well known. The sending of letters, enclosure slips, etc., to men who fail to report; the preparation of News Letters for reporters, to maintain interest; sending them publications of various kinds; all these methods have been used for many years, and need no description here. Their value is indicated by the relatively high per cent returns obtained in the states that use them. In the rush of things, it is sometimes hard to find time to give proper atten-

tion to building up and maintaining the mailing lists, but it is an investment that pays good dividends.

In a few states part of the seeming discrepancy in costs is perhaps due to differences in bookkeeping. In some states apparently items are charged against the General Schedule that should be charged against other projects. There have been cases where acreage inquiries and livestock inquiries have been charged against the General Schedule, and in one or two cases travel was charged against this Schedule instead of against specific projects. It is quite important that charges be properly allocated between projects in accordance with the instructions, if the cost records are to serve the purpose for which they are intended. We want to keep this bookkeeping as simple as possible, but at the same time it is important that uniform procedure be followed in all states. Whenever the present instructions are not clear, statisticians should write in for further explanations.

The matter of general efficiency in office management is too broad a subject to be covered in a brief discussion of this kind. All I can attempt is to touch on a few matters of general application, which are already in use in those offices which have relatively high efficiency. One important consideration is keeping the work of the office carefully planned at least three or four weeks ahead, and in some cases longer. In this way it is possible to do beforehand many of the jobs that otherwise will have to be done later in the middle of a peak load of work. Such work as preparing charts, heading up listing sheets, addressing envelopes, preparing historic data, and other similar jobs, should be done as far ahead of time as possible in order to facilitate the work that cannot be set ahead.

It is also important that each person in the office have a fairly definite idea of what his work is to be for at least a few days in advance. In some offices considerable time is lost at the beginning of each day because the workers do not find out the night before what their work is to be the next morning. Before leaving the office each person should have a definite plan of the work to be taken up immediately on his return. There are many times when work plans have to be changed, but this does not eliminate the need for having a plan. The Junior and Assistant Statisticians and Head Clerks usually have responsibility for planning much of the routine work, and the relatively high efficiency of some of our offices is largely due to their efforts.

The cooperation of the Washington personnel is essential in keeping the work of the field offices running efficiently. The best laid plans of a field man can be made worthless, and efficiency seriously reduced, if special requests for extra work are sent out from Washington without allowing enough time for readjusting the work already under way. I know that nobody in the Washington office wants to be unreasonable, but it is hard for men working in commodity sections there to know at all times how many other projects the field offices are being required to carry on at any particular time. For this reason, special requests for additional work should not only be held to a minimum, but all such requests should be made as far in advance as possible so that

the field men can properly adjust their work to take care of them. I have known of a few cases when requests for special work were purposely delayed in Washington until shortly before the work was to be done, for fear the field men would overlook it when the time came. I cannot too strongly condemn this and am glad to say that I don't know of its being done recently.

In some offices a surprising amount of time is lost in friendly visiting among the employees. Sometimes this is hard to prevent, and certainly the atmosphere in all our offices should be friendly. During working hours, however, each employee should constantly keep in mind the need not only to keep himself busy, but also to avoid interrupting the work of others in the office.

One cause of lost motion in some offices is inconvenient arrangement of the desks and equipment, and the lack of well organized files. The details of office arrangement differ in each office, of course, but convenient arrangement of desks so that they all have good light, and orderly arrangement of equipment and files materially helps in increasing both the amount and quality of the work done. The wide variety of material we must keep on hand for work and for reference makes it essential that the files be properly organized to begin with, and carefully kept in order at all times, if confusion is to be avoided. A filing system was devised in 1919 for use in our field offices, described in F. A. 322 which is now long out of print. This would need some changes to take care of our present needs, but there would be definite advantages in having a uniform filing system in use in all our offices.

The subject of "Field Office Management and Problems" is so broad that this brief discussion has only touched some of the edges of it, but perhaps I may have brought out a few things that will stimulate further thought. The need for office efficiency has always been with us and is constantly growing more serious as our work increases.

Maintaining efficiency requires careful and constant study, but it takes more than mere planning to obtain results. The best of plans cannot become effective until they are put into action, and the fine results that are being obtained in some of our offices may well stimulate some of the others along the same line.

OFFICE PROBLEMS AND MANAGEMENT

K. D. Blood,
Statistician, Oklahoma

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Decentralization of lists from Washington to the field during the last few years, as well as the additional work required in providing the AAA with county estimates, has increased the load in field offices to such an extent that careful planning of office details is necessary.

Prior to the advent of the AAA, county estimates were considered out of the question except in those states where assessors' records were available. Now, county estimates have become one of the most important details of the field offices, especially since these estimates are the basis of acreage allotments and payments to the various counties. The preparation of county estimates requires endless work in field offices and is the source of much worry.

In order to improve county indications, lists have had to be increased as much as time and available labor would permit. Indications from all sources have had to be worked in detail by counties. AAA data have had to be assembled and the two sets of material correlated. Frequent revisions of state totals have necessitated revisions in county data. Since 1930 an important source of indications has been developed from listing identical reports. At the present time all important surveys made by the Division must be matched, requiring much more clerical help than was needed before this procedure became important.

Another detail which requires much time is that of making dot charts. For various reasons including drought conditions and yearly revisions of state estimates, dot charts have to be remade each season.

All of these increased and increasing activities have made it necessary to plan each office detail carefully in order that time and labor might be used to the best advantage. For example, all cards and schedules which have to be <u>matched</u> the following year are arranged in <u>alphabetical order</u> before they are filed. This lessens the work when the current report is listed. Dot charts are made before the crop season begins, thus relieving some of the pressure on crop report days.

The work in any office can be accomplished most efficiently when there is a cooperative spirit among all employees. The officer in charge should make every effort to promote this spirit. Efficiency in an office is increased by making every individual responsible for certain tasks, and by being sure that the details of every operation in the office are familiar to more than one individual.

Probably the most important phase of our work is that of securing adequate returns from crop reporters. Constant effort is necessary in keeping lists active. In order to maintain interest among crop reporters we find that in addition to monthly crop reports, the Annual Year Book, the Agricultural Situation, and News Letters, a letter to each individual is helpful in keeping in touch with the reporter. To those who have submitted reports regularly, a letter of commendation is written, just before the crop season starts. And to those who haven't reported regularly, a letter is written attempting to induce them to resume reporting. As much effort should be spent to retain the services of old reporters as to secure new ones who will replace them. However, we find that maintaining lists is a task most easily neglected when other work interferes. The publishing of a so-called Honor Roll seems to increase the percentage returns for a time.

Our mimeographed releases are becoming more and more of a problem because of the large number we send out and because of the poor quality of paper used. We find that only about 2,500 clean copies can be mimeographed from one stencil and we frequently mail as many as 15,000 copies. Unless a number of stencils are cut, the report is very unsatisfactory, and because of the complicated tables, much time is used when several stencils are typed.

The problem of securing adequate filing space and sufficient equipment in which to store carrier cards, listing sheets, summary sheets and other records is also troublesome. Sheets are damaged and frequently lost, and much time is spent searching for records because of inadequate space and equipment. The historic record sheets now being used for recording crop statistics are a great improvement. Previous to their inauguration much time was lost in searching for reported condition, acreage and yield figures.

INVESTIGATION OF POSSIBILITIES OF LONG-RANGE WEATHER FORECASTING

Charles F. Sarle

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A knowledge of how weather influences crop growth and production, and an understanding of weather and its causes, not now known to modern science, would be extremely helpful in making accurate forecasts of yield per acre. These are two highly complex and difficult problems that cannot be solved single-handed by any one science or any one agency.

Many approaches to the problem of long-range weather prediction have been made in the past and success has been claimed for many of these systems. If a reasonably reliable method could be found, crop forecasting could be placed on a firmer footing and a planned agricultural economy could be established and be carried out more wisely.

A study of the possibilities of long-range weather forecasting naturally has two phases: (1) a critical appraisal of existing methods and results obtained, and (2) the development, if possible, of new or improved methods.

Evaluation of Present Methods:

Early in 1936 the first phase of the study was undertaken. An analysis of existing theories and methods of long-range forecasting was carried out along both physical and statistical lines. No system was found that could be reliably applied to long-range forecasting beyond a period of 5 or 10 days, but the ground has been cleared for further studies that might lead to the development of new methods or techniques applicable to forecasting. It is expected that the results of this reconnaissance survey of existing methods of long-range weather forecasting will be published in the near future.

Analysis of the Northern Hemisphere Charts:

Beginning in the fall of 1936, the analysis of a continuous daily series of Northern Hemisphere charts has been carried on. The purpose of this method of attacking the problem is (1) to discover how deviations from normal weather may be traced to the activities of the "centers of action" in the atmosphere; and (2) to look for clues as to the future state of the general circulation.

There is a close correlation between the circulation pattern and the local anomalies of the different meteorological elements. By the circulation pattern is meant the location and intensity of the so-called centers of action, or the semi-permanent centers of high and low pressure, with their corresponding prevailing winds. As these centers of

action depart from normal, we have a corresponding departure from normal of the air movement over the Northern Hemisphere. Such a displacement results in displacements of the zones of maximum storminess, with resultant persistent anomalies in all the meteorological elements.

The appearance of the general circulation patterns on the surface of the earth is probably an indirect expression of high altitude effects. Unfortunately vertical soundings of the atmosphere are too few at present to permit adequate investigation of effects of the upper air over the entire Northern Hemisphere.

The line of attack which seems to offer most hope of further progress in the long-range forecast problem must be based on the investigation of the mechanism by which a given circulation pattern is established, maintained, and terminated. The very fact that definite anomalous patterns of the general circulation persist for long periods of time is an indication that there must be some system to the control conditions. This encourages the belief that it should eventually be possible to gain sufficient information of the controlling factors that such anomalous conditions may be reliably forecast.

Winter Weather:

While this preliminary work was being carried on, Mr. H. Wexler of the Weather Bureau started the investigation of the building up of the domes of cold air in northern Canada which move southward to form the winter cold waves of the United States. He found that the coldness is caused, first, by cooling of a shallow layer of the air by contact with the snow surface, and, second, after this temperature near the snow surface has reached a certain minimum, the temperature of a large section of the upper atmosphere starts to cool off with it. In this way, the low temperatures can be spread upwards to form the deep, cold currents that are observed.

The formation of the Polar continental high is accomplished mainly through radiation processes. The upper air above the cooled surface radiates its heat and the downward-radiated heat is absorbed at the snow surface and there re-radiated to space. This re-radiated energy, however, is at wave lengths that are not absorbed in the atmosphere. Consequently it passes on through to outer space. Thus the upper air loses heat in radiation by way of the snow surface. Since the formation of the Polar continental high usually takes place in air that has recently come from the northern Pacific through Alaska to Canada, the conditions could be applied in a manner approaching long-range forecasting calculations for possibly 10 days or two weeks.

In order to obtain additional information on the process and to test certain hypotheses, soundings of the upper air were conducted in Alaska last winter and are being continued this winter. Last winter the Canadian government cooperated in the establishment of a station for similar soundings at Ft. Smith, Northwest Territory.

The problem of determining the direction in which these cold fronts will move is being studied in cooperation with the Meteorological Division of the Massachusetts Institute of Technology. No very definite results can be reported as yet.

Summer Weather:

From the work already done, it appears that summer weather conditions in the United States are dominated by the developments in the warm oceanic areas of high pressure, or anticyclones. Practically all evidence points to the hypothesis that these warm anticyclones are great eddies in the general circulation over the earth. It seems logical that the approach to a solution of the problem should be from a study of the dynamics of air currents. Certain features of circulations such as those in the atmosphere can be simulated in the laboratory by fluid experiments in tanks. In tracing the path of the fluid particles in these experiments, certain types of "flow patterns" are noted. In the free atmosphere we can trace the flow patterns by means of a network of simultaneous daily airplane soundings such as we have in the United States.

Striking agreement has been found between atmospheric flow patterns and fluid flow patterns in tank experiments. This has permitted mathematical solution of the simpler types of flow problems. This research has been going on only since last fall and it is a little too early to state the results. In general, it has been found that the atmospheric circulation has more of an eddying character than previously was supposed. A rather comprehensive publication presenting these recently developed concepts of atmospheric behavior is expected to be ready for the printer some time this summer.

Solar Phenomena:

Another far different type of investigation has to do with solar variations as they may affect the atmospheric circulation. Special attention is now being given to atmospheric ozone as a possible link between solar activity and changes in the circulation of the atmosphere. The atmosphere contains a very small percentage of ozone, so small that measurements of changes in the ozone content are difficult to make. However, these changes appear to be significant and are correlated with weather conditions. Measurements made thus far, mostly in Europe, show that the ozone content is at a minimum near the surface center of a warm high pressure area and at a maximum on the rear side of well developed low pressure systems. The greatest quantity of ozone is observed in high latitudes, the least near the equator.

It is known that ozone is very active in affecting radiation at wave lengths in the ultra-violet region of the spectrum. It is considered possible that the solar radiation at these wave lengths, which appears to be variable, is connected with atmospheric changes, the ozone acting as a connecting link. As yet no regular ozone observations have been taken on this continent but efforts are being made to start a series of such measurements.

This investigation has been both preceded and accompanied by a project in cooperation with the Harvard Astronomical Observatory. Doctor Menzel is developing an instrument for measuring the sun's corona without waiting for an eclipse to block out the sun and make the corona visible. Plans are under way for attaching this instrument to one of the larger telescopes at Lick Observatory. It is possible that variations in the sun's corona may be more readily subject to accurate measurements than the variations in solar radiation as made by Doctor Abbot.

Statistical Studies:

In conclusion it may be pointed out that although great stress in this discussion has been placed on the physical-meteorological studies, the statistical approach to this problem of long-range weather forecasting has not been curtailed. This emphasis on a purely meteorological side is advisable because so far as is known this represents the first concerted attack on the long-range weather forecasting problem from that point of view. The idea has been to put to work on these investigations the best minds in meteorology and to direct, if possible, the most promising meteorological research into lines of development which could have a bearing on the general problems. This emphasis on an understanding of the forces involved is an essential background to a statistical study of observed phenomena. It is the combined approach of the physical and statistical methods that can be expected in the long run to produce the best results in the development of practical methods of long-range weather forecasting.

RESEARCH

Charles F. Sarle
In Charge Research Section

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The investigations on (1) sample census methods, (2) crop-weather relationships, and (3) the possibilities of long-range weather forecasting have been made possible by special research funds. This work has been carried on in cooperation with other governmental agencies and research institutions, and the counsel of others has been of material assistance. The results of each of these three projects, however, have a direct bearing on the future work of our Division.

Furthermore, the men employed in this work are getting intensive training in several fields of science that are basic to crop and livestock estimating and forecasting. In fact, it is expected that the research projects will continue to be utilized, in part at least, as a means of training men already in our organization. The best performance of the work of our Division requires that we have men who keep fully informed of the latest developments in many fields of science related to agriculture, economics, and statistics.

RESEARCH IN FIELD OFFICES

Several lines of research are open to the men in our field offices as time and pressure of work permit. One of our most urgent needs is the critical evaluation of existing methods, techniques, types of inquiries and methods of interpreting, in order that the most efficient and reliable ones may be retained or improved and the "dead wood" eliminated. Research of this kind will bring to light the weaknesses of existing methods and point out the direction that improvement in methods should take.

Every statistician desires to improve the accuracy of the forecasts and estimates now being made. In each field office there is a limit to the "man power" available for the load of work that is demanded. Consequently we have the very practical problem of determining how to use our limited resources, clerical and professional, to the best advantage. Research in methodology will help in determining the most efficient use of our resources in attaining the improved accuracy in our estimates that all of us so much desire.

1. STATISTICAL ANALYSIS OF METHODS

How accurate is a given estimate or series of estimates? The answer to this highly important question can be obtained by determining

(1) the statistical precision of the average, ratio or other term calculated from the sample, and (2) the bias of the sample. The more objective the entire process -- the observed measurement of the phenomenon being sampled, the method of sampling, and the method of estimating -- the higher should be the precision and the more predictable the limits of error.

(a) Internal Analysis--Precision

Much can be learned concerning the precision and efficiency of a sample from an internal analysis of the sample data, especially if the sample is taken with this purpose in mind. For example, the case of boll counts on cotton. To attain a specified degree of precision in the sample average, it is important to know which would be more efficient: to increase the counts made in each field or to increase the number of fields where the counts are made. If the observations within the fields have been replicated (two or more samples taken) and randomized and the selection of the fields has been objective, the application of the "analysis of variance" will furnish the answer to the above question of the most efficient way to increase the precision of the count samples.

Research is needed to determine to what extent (1) stratification, (2) the use of matched samples, or (3) the increase in number of observations will increase precision of an indication. Two papers in particular, given at this conference, point out the need for greater use of stratification within the crop reporting district -- the paper on yields in drought areas by Mr. Bodin of Minnesota and the paper on potato yields by Mr. Church of Michigan.

The usefulness of the matched sample depends upon the amount of correlation between the paired observations in the two samples. The higher the correlation, the greater the precision of the matched sample. The acreage of any major crop in an important producing area, such as corn in the Corn Belt, usually shows a high correlation from one year to the next on matched farms, whereas an "in and out" crop is not likely to be highly correlated, especially when one farmer grows it one year and another farmer the next. The possibilities of using matched samples of individual farms for fruit trees and production are very good indeed. Apple growers cannot switch from one crop to another from year to year, as can broomcorn or clover seed growers, for example.

It would be reasonable to expect that the matched sample of individual farms would be especially useful in making year-to-year estimates (1) of change in the acreage and production of highly localized crops grown under special conditions of soil or climate where only certain favored farmers can and do grow the crop -- muck soil crops, cranberries, possibly strawberries, for example; and (2) of the change in acreage of major crops by counties in important producing areas, or numbers of milk cows in important dairy sections. In all these causes the assumption of a high correlation may be tested from available data.

(b) External Analysis--Testing Samples for Bias

If the precision in a given sample is sufficiently high, then the next question to raise is that of bias.

A sample may be biased either because (1) it is not representative of the universe from which it is drawn, or (2) the observations themselves are biased either intentionally or otherwise as may be expected from highly subjective observations, or both causes of bias may be present.

External evidence is needed to detect bias or to measure it, whatever its cause. A comparison of the distribution of a sample with Census data in the Census year, either geographically, by size of farm, or by whatever factor that may be correlated with the phenomenon being sampled, will furnish a clue as to representativeness "for that year". If proper system of current weighting is obtainable it will aid in correcting for selectivity. Where a system of weighting is impracticable, a quota system of obtaining reports will help. A system involving further stratification and corresponding use of weights, along with the number of observations in each stratum determined in proportion to the variability within each stratum, should give greater accuracy.

Bias is determined by comparing the indication or estimate with the "actual" or with independent estimates based upon check data from the field of marketing or processing statistics -- cotton ginnings, railroad and truck shipments, livestock processed, chickens hatched, etc. -- from assessors' or other enumerations and surveys. If the indication differs from the "actual" by more than might be expected from the sampling error or precision of the average or ratio, a statistician suspects a biased sample -- either biased observations or a biased method of sampling.

One research problem that could be handled in any office would be to test the usefulness of the judgment inquiry and the acreage and production inquiry on yield per acre, both handled in a relative rather than in an absolute sense. The yield per acre in the census year could be taken as a base and the two samples used from year to year separately and in combination to indicate the change in yield. In this way we may see how the series would check with the yield obtained by the next census. In a State where assessors get acreage and production, as in Iowa, a much more satisfactory study can be made along this line.

If the difference between two sample indications is no larger than might be expected from the sampling errors, the two indications can and should be combined into a weighted average, using the precision of each of the samples as weights. These are called "precision weights".

(c) Methods of Estimating

The matter of using a system of weights in combining indications purporting to represent the same universe also can be approached by the use of correlation, provided independent estimates based on check data are available. The regression coefficients may be used as a starting point in establishing weights in lieu of precision weights mentioned above. The regression weights are based on the average usefulness of each of two or more indications in estimating a given phenomenon over the period covered by the study, whereas the precision weights are based on an internal analysis of the sample in one or more years. The precision weights can be used until such a time as check data may be developed and a period of years are available for analysis.

The first step in developing more objective methods of making estimates from two or more indications is to set down in systematic order the weights actually used in making current estimates. The next time you have to make the same estimate you can look back and see what weight you used the last time. Eventually you will have a whole series of these "quantitative expressions" of the exercise of your judgment. Furthermore, when your estimates are reviewed, you and the reviewer will have something definite to argue about. Eventually you will find yourself doing some needed research in order to support your end of the arguments.

Another essential step in making it easier to use more than one indication in making an estimate is to unscramble such "overlapping" indications as the identical farm sample from the entire sample used on a ratio or ratio-relative basis. We want "mutually exclusive" indications. It is much easier to assign weights to them or even to combine them "subconsciously" as is now the general practice.

2. CROP-WEATHER RESEARCH

The possibilities of determining more objective methods of observing crops and their environment, as a basis for more objective methods of forecasting and estimating yield per acre, have been discussed by Mr. King. I am sure that each of you has in mind an important crop for which you would like to be better able to forecast the yield prior to harvest. A step in this direction is to find out all you can concerning the response of such a crop to weather from the plant scientists at the Agricultural Experiment Station and the Agricultural College of your State. You will find that you have a problem of common interest that can be explored to mutual advantage.

Perhaps your questioning and continued association with these persons will lead (1) to superimposing of "structural counts and measurements" on existing experiments and (2) to the installation of additional meteorological and other equipment providing for measurements of evaporation, relative humidity, wind velocity, soil moisture, temperature, etc., as well as the usual maximum and minimum temperatures and daily amount of precipitation. All Agricultural Experiment

Stations should be taking such measurements if they are to learn <u>why</u> one variety yields more than another, or <u>why</u> one soil treatment gives higher yields than another in certain years. In making these contacts the botanist, ecologist, plant pathologist, entomologist, and soil scientist should not be overlooked.

3. ECONOMIC STUDIES

The operation of economic forces causes many of the year-to-year changes in acreage, numbers of livestock, and livestock products. Every estimate of change in these items based on sample indications should be accompanied by an independent estimate of such change based on an economic analysis of the factors involved. These research studies are in the field of "production economics".

I think that each Agricultural College and Experiment Station in the 48 States has an agricultural economics department. What are the men in these departments doing in the way of research to throw light on these problems of the factors that determine changes in agricultural production? Visit these men; take an inventory. You may get ideas that you can use in making such studies yourself.

In States where our office and the Agricultural College or State University are in the same city or within easy commuting distance, it should be possible to encourage advanced students to undertake research projects in this field.

Cooperative projects in the development of Farm Price Index Numbers have been undertaken in a number of States. Other types of index numbers relating to prices farmers pay and agricultural production might also be developed.

In many States special historical studies are needed for building up farm price series for the State and for important commercial areas within the State. This is a fertile field for a cooperative project with the agricultural economists at the Agricultural Colleges. Many of our present series of prices of localized commercial crops are in need of thoroughgoing revision along these lines.

4. ASSISTANCE TO FIELD OFFICES

Our small research group in Washington can be of greatest use to the field offices and the Division as a whole if specific problems are put to us either in the planning or in the appraisal of the results of an investigation. We may have suggestions that will prove helpful. Try us and see!

The results of research under the first suggested topic -- Statistical Analysis of Methods -- should be made available to other workers in the Division in the form of mimeographed reports. Results of research under the other two topics -- Crop-Weather and Economic

Studies -- would be of interest to scientific workers in the Division and outside and might well be given broader distribution through publication in the journals of recognized economic and scientific societies.

Every office should take stock of its most pressing problems and plan to get a research project started that is directed toward an understanding and a possible solution of some one of these problems. We will be glad to help in planning this research and in checking with you from time to time as the work develops.

THE CROP-WEATHER PROBLEM

Arnold J. King, Agricultural Statistician,
Bureau of Agricultural Economics

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One of the earliest studies of the relationship between climate and crops was made by Lawes and Gilbert of England. Their studies pointed out the dependency of wheat production in climatic factors. Shaw, in 1905, found the yield of wheat in England tended to decrease when autumn rainfall was above average and expressed the relationship in a mathematical formula. The application of correlation methods in yield-weather studies was made as early as 1907 by R. M. Hooker of England. Correlation methods have been used by other investigators -- J. Warren Smith and his successor in the Weather Bureau, J. B. Kincer, in the United States; S. M. Jacob in India; Wallen in Sweden; and many others. During the early 1920's R. A. Fisher investigated the influence of rainfall on wheat yields at Rothamsted Experimental Station.

In all these studies the investigators have had unsatisfactory and inadequate data with which to work. It has been difficult to discover dependable relationships between weather factors and crop yields that would stand the test of actual forecasting beyond the period covered by the original studies.

The British Agricultural Meteorological Scheme, drawn up in 1924, recognized the inadequacy of existing weather and crop data. This scheme was a start in obtaining weather and crop observations simultaneously and at the same place. Four kinds of observation were called for; (1) meteorological, (2) agricultural or (3) horticultural, depending on the crop, and (4) phenological (dates of emergence, flowering, etc.).

The inadequacy of the original British plan inaugurated in 1924 became apparent with experience and led eventually to modification that provided for greater attention to obtaining more <u>precise measurements of plant growth and plant characteristics</u>. The British program of research has grown out of an appreciation of the need for a concerted attack on the problem of crop-weather relationships by agronomists, meteorologists and statisticians. The primary purpose of the program is to develop reliable objective methods of crop forecasting based on either measurable characteristics of the plant before harvest or weather factors, or a combination of both.

There are two general approaches to the problem of developing a more objective basis of making forecasts of crop yields. These are: (1) objective measurements and counts of the plants themselves; and (2) observations of the weather and the more variable soil conditions. These approaches complement each other and consequently may be combined.

When work was undertaken on a crop-weather problem approximately two years ago, there appeared to be two lines of attack -- (1) along "extensive" lines, utilizing available weather and crop yield data on a geographic area basis, and (2) a more intensive approach, that of utilizing crop and weather data available from agricultural experiment station records. Previous experience with correlation studies along extensive lines served to discourage an immediate attack along such lines and suggested the need for the intensive approach to determine what plant characteristics and what weather factors are related to yield, and the nature of such relationship. It was thought that by taking yield data from carefully conducted experiments and pertinent weather data recorded at the same locations, certain problems of sampling inherent in the extensive approach could be avoided. It was considered important to determine not only what factors appear to be related to yields but also why these factors operate to influence yield.

Pertinent crop and weather data were drawn off from the records of various experiment stations. It was found, however, that very little of the data needed for crop-weather research had been obtained at the agricultural experiment stations. Practically no records were available concerning either phenological dates or structural counts and measurements of plants that would furnish information regarding the nature and rate of growth. Meteorological data were limited almost entirely to daily precipitation and maximum and minimum temperatures. Very few of the state experiment stations had any records of relative humidity, rate of evaporation, or soil moisture. These experiments had been designed to test varieties, fertilizer treatments and cultural practices and had not been designed for purposes of our study.

When we approached the agronomists at these institutions and in the Department to find out what was known of the subject of how weather influences growth and yield, we received very little information based on experimental evidence. In fact the available scientific literature on this subject has not been sufficient to enable us to set up reasonable hypotheses as to the relationship of weather to crop growth and yields, which could be tested against the available experimental data.

We have reached the conclusion that the principles needed in developing "extensive" methods of forecasting the yield of a crop for a large geographic area, such as a state, must be developed from "intensive" research -- either with experimental plots or in the laboratory (greenhouse). We need to know: (1) what weather and soil records most accurately measure the meteorological and soil environment to which the crop responds during growth; and (2) what measurements and structural counts most accurately measure plant growth, and which would, in some measure, reflect the final yield.

It is the belief of many agronomists in England and certain other foreign countries that the science of agronomy can develop more rapidly and on a sounder basis if field experiments are designed to include measurements of weather and crop growth factors. A given variety or a particular soil treatment may give very different results under one type of weather conditions than under another. American agronomists cannot

afford to ignore these facts in designing their experimental work and in interpreting the results.

We are finding that we have a common ground of interest with the agronomists, ecologists, plant physiologists and soils scientists of our agricultural colleges and experiment stations. We have gone to them with questions designed to give us an understanding of how crops respond to changing weather and soil conditions. They have very little to give us in reply. They usually acknowledge real interest in these problems and admit that research work should be directed along these lines. In many cases they are willing to sit down with us to explore the possibilities of superimposing on current agronomic work the additional objective of obtaining weather and crop growth data that would be useful in determining plant responses to changing weather and soil influences.

Many experiment stations are increasing the efficiency and usefulness of agronomic data collected from field plot experiments by using the more efficient types of experimental design that have been developed in recent years by Dr. R. A. Fisher of England and others. The present is an opportune time to stress also the importance of obtaining more comprehensive crop, weather and soil records. If the experiment stations will do this, we will then have the data necessary for our work in developing objective methods of forecasting yield per acre and of keeping such methods up to date as new and improved varieties or changing soil treatments and practices replace those now in use among farmers.

A small wheat project is now under way at Manhattan, Kansas, in which three Government agencies -- Bureau of Plant Industry, Weather Bureau and the Bureau of Agricultural Economics -- are cooperating with the Kansas Agricultural Experiment Station. The main object of the Kansas plan is to determine experimentally what measurements of a crop and what observations of the weather and soil will afford the most efficient basis for making forecasts of yield per acre of wheat. Different methods of sampling will be tried and evaluated for efficiency in yielding information.

The general procedure outlined in the plan is to measure the effect of various combinations of environmental conditions upon yield as expressed through each attribute of yield, such as stand, number of kernels, weight of grain, etc. This requires the taking not only of more comprehensive weather records than were taken by the Experiment Station in the past but also of periodic measurements of the crop itself in such detail as to provide an indicationof the rate of growth as well as the ultimate attainment of each attribute of yield. In addition to a record of daily rainfall and maximum and minimum temperatures, a record is made of relative humidity , rate of evaporation from both free water surface and from porous cups, soil temperature, and soil moisture, as well as certain measures of soil fertility.

The crop observations will include plant counts to determine dates of emergence, heading, extent of tillering, number of heads, etc., and also measurements of the height of plants. Special plots have been set aside and designed specifically for these observations and also for observations concerning dry weight determination, and sugar concentration, which necessitate the destruction of samples of the plants from the experimental plots. The number of observations on the plots where the plants are to be observed will be large enough to obtain a fairly accurate record of the relative changes throughout the season as well as from year to year. The plan as a whole calls for a coordinated attack by the agronomist, the plant ecologist and physiologist, and the soil specialist on the problem of differentiating between the effects of the properties of the soil, the environmental conditions, and plant characteristics on the growth and yield of wheat.

The intensive phase of the crop-weather studies can be carried on along what might be called two levels of research -- (1) the agronomic and (2) the physiological. Research along the agronomic level is similar to the work being carried on under the British crop-weather scheme, which places major emphasis on the determinationof what measurements of the plant and what measurements of the environment appear to be most highly associated with yield per acre. These measurements on the agronomic level can be made upon already existing plot experiments concerning varieties, soil practices, and fertility, as they <u>do not involve the destruction of samples of the plants</u> at any time before harvest. It is essential, however, that the existing experiment be replicated and randomized if tests of statistical significance are to be applied to the results. Research along the physiological level involves the destruction of samples of the crop from the experimental plots. This calls for special plots to be set aside and designated specifically for these observations. The intensity of the work along the physiological level will be limited largely by the ability, ingenuity and curiosity of the plant physiologists, ecologists and soil specialists who become interested in this research at their respective stations.

The British have found that it takes several years of careful work with a given crop to determine what measurements to take and how to take them and to perfect methods of sampling adapted to the peculiarities of a given crop. Wheat and other small grains no doubt present the simplest problems in this regard. Corn is somewhat more difficult. A larger land area is necessary, especially for physiological measurements.

Once we have worked out from experience reasonably satisfactory sampling technique for the respective crops, it will then be possible to write out rather explicit instructions concerning these matters for the use of agronomists and others who may become interested in research in the field of crop-weather relationships. There is no way of determining these procedures without experimentation.

It is interesting to note that directors of experiment stations and others with administrative responsibilities are quick to see the

advantages of including the crop-weather research in agronomic experimental work, as it provides for integration and coordinated attack on fundamental problems on the part of research workers in related but at the present time separate fields of endeavor.

Accurate predictions or estimations of the yield of a few experimental plots would be of little use in predicting or estimating the yield for a large geographic area. The prediction of the average yield of a district by crop measurements can only be undertaken by measurements on commercial farms in that district.

It is reasonable to expect, however, that the knowledge that we will get from these intensive experiments will be useful in setting up methods of sampling for commercial areas, using the route method now applied to cotton and corn or samples of fields from individual farms. The research along physiological lines can be expected to lead toward an understanding of how crops respond to weather. Such an understanding on the part of our crop estimators will enable them to interpret changing conditions during the growing season much more effectively than on the basis of their present somewhat limited knowledge.

In other words, this intensive research is designed as a foundation for more objective methods of forecasting and estimating crop production, and for more comprehensive understanding of how the forces of nature operate in the production of our important commercial crops.

POSSIBILITIES OF OBJECTIVE METHODS OF FORECASTING AND ESTIMATING YIELD PER ACRE

Arnold J. King, Agricultural Statistician,
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GENERAL CONSIDERATIONS

Present methods of estimating and forecasting are not fully satisfactory; first, because we must depend upon the returns from volunteer crop correspondents rather thanon samples selected according to rigid specifications, and, second, because the observations themselves are highly subjective in that the statements of the farmer may be both inaccurate and biased. In view of the inherent limitations of the basic figures, we must recognize that a point exists beyond which it would be a waste of money and effort to attempt to increase the accuracy of the forecasts and estimates by increasing the size of the sample, or by obtaining either a better distribution of the sample or a refinement of the statistical technique of measuring the relationships.

There is a growing demand for greater detail and accuracy in the Bureau's estimates and forecasts of yield. We will no doubt eventually find ourselves in a position that will necessitate tightening up the methods used. In view of the amount of bias in the basic figures now being gathered, there is no alternative than to obtain more objective basic figures.

At this point, let us distinguish between objectivity and subjectivity as applied in the field of statistics. The greater the amount of judgment used in obtaining a numerical expression of the facts, the more subjective is the observation. To illustrate, suppose we have a plot of wheat and it is necessary to obtain an estimate of the height of the plants. One method would be to have several individuals guess at the average height. The accuracy of such a method would depend entirely upon the skill of the individuals and the number guessing. There are some who will say that if a large number of individuals are allowed to guess at the average height the errors of estimation would compensate. I, personally, would not trust any average taken in this way, no matter how many guesses were made, because I would be afraid of bias affecting the results. There would be no way of anticipating the degree or direction of this bias. If the same individuals guessed the height of several plots of wheat, the magnitude of the bias could be assessed by correlating the estimated height with the actual heights.

But this type of analysis would be of little help because the bias is not likely to be constant fromone guess to another, and, unless the various biases can be isolated, the prospects are that

they cannot be reduced or handled statistically.

This method of estimating is purely a subjective one. The estimate can be made more objective by actually measuring the height of several plants. But, if the individuals used their judgment in selecting what they thought might be representative plants, the method of selecting the sample would be subjective. A sample thus chosen would probably give a biased estimate. The odds of obtaining an accurate estimate could be greatly increased by using a more objective method of selecting the sample that would include the use of some form of stratification and randomization.

THE POSSIBILITIES OF OBJECTIVE METHODS IN ESTIMATING CROP YIELDS

The accuracy of samples now being gathered by the Bureau of Agricultural Economics for estimating crop yields is generally being tested by a correlation of the samples with the Bureau's estimated yield, and these estimates are, in turn, based upon sample data. The danger in this procedure lies in the fact that in many cases the Crop Reporting Board does not have an accurate basis for checking all the estimates, and, since the estimates are made to agree with the sample indications, the degree of correlation can be misleading as to the accuracy of either the indications or the estimates. It is true that the Census and the assessors' data, and those obtained through several Bureau schedules worded in different ways, tend to serve as checks against spurious correlations. It may be well to point out, however, that every one of the aforementioned indications is based upon the farmers' statements of the situation, and it is conceivable that the same sort of bias could occur in all the inquiries.

With subsidies being based upon reported yields per acre, and with other factors coming into the agricultural picture, no one knows what effect these factors and the new biases willhave upon the reported yield figures, and it is likely that past relationships will be of little help in evaluating them. An independent sample having a different and more objective basic figure would serve not only to check the different types of bias, but also to point out the source of the errors of estimation.

There are several ways of getting around the use of the farmers' statements as a basis for making an estimate of yields, among which are -- (1) taking samples of the standing crop shortly before harvest, and (2) basing estimates upon the factors that constitute the crop's environment. The latter method is no doubt an inefficient method for estimating crop yield because of the vast amount of data that is needed to describe fully the crop's environment.

The corn and cotton sections have developed objective methods of estimating the yield per acre by sampling the crop. Although the samples gathered have not been large, the results indicate the possibilities of these objective methods.

Many factors enter into the problem of sampling the crop, such as, (1) the size and shape of the sampling unit, (2) the number of samples taken in the field in relation to the number of fields, and (3) the problem of selecting the farms and the location of the units within the fields. To date we have done practically nothing toward determining the size and shape of sampling unit and the number of samples in a field and the number of fields that will give the most precise basis for an estimate. Under the present scheme, we decide a priori upon a method of sampling the crop and after several years we determine whether the sample was a good or bad one. But even then we do not know whether the sample is the most efficient one.

The sampling technique employed by the Bureau for obtaining crop measurements has not provided for a replication of the sampling unit within the fields and in some cases has not provided for a random selection of the sampling units within the fields. Consequently the sample does not afford a reliable and an unbiased estimate of the sampling error. Nor will an internal analysis of the data determine whether the amount of sampling actually done is adequate, excessive or insufficient for the purpose at hand. The adequacy or inadequacy of the sample depends on the relation of the sampling error to other errors affecting the results.

It is essential, consequently, that the program, at least in the early stages of development, be planned so as to determine the sampling errors also. Yates, for example, found that in England it would take 10 times the number of samples to reduce the standard error of the average of the yield sample by 1 per cent, if the increase in the number of samples were confined to the number of samples within the field rather than the number of fields sampled. We need similar studies in this country if we are to obtain a reliable indication of the possibilities of using crop measurements as a basis for estimating crop yields and if we are to get the maximum accuracy for the amount of money and effort that we may have to spend on observing the crop.

The possibility of using samples of the crop as a basis for making estimates of yield per acre doubtless differs among crops, depending upon physical aspects of the problem. For example, a technique for sampling root crops would probably be materially different from one developed for cereal crops. The Bureau has spent a limited amount of time and money developing an objective sampling technique for estimating the cotton crop. Yet the cotton plant is probably one of the most difficult to sample from the viewpoint of obtaining a numerical expression of the attributes of yield. The cotton plant blooms continuously and is therefore much more indeterminate than wheat and corn. The cotton problem is further complicated by the fact that the bolls vary in size, depending upon the age and location of the bolls on the plant. There are many other disturbing factors, such as bollweevil and shedding, that have to be taken into consideration. The many complications accentuate the need for a more concerted attack on the cotton problem.

There has been practically nothing done on wheat or the other cereals, even though the plants have well-defined attributed of yield

and are determinate in growth. The yield of the cereal crops is the composite of three attributes of yield: (1) the number of heads, (2) the number of kernels, and (3) weight of grain. Since all three attributes are concrete, they are especially adaptable to sampling. The fact that wheat reaches maturity in late May in Texas and the date of harvest advances as one moves north, is of practical advantage from the viewpoint of sampling, since one person can start in Texas and by working north can obtain a composite sample of the entire wheat crop just before harvest.

The problemof sampling the wheat crop is a relatively simple one. The sampling unit can be defined without measuring, by the use of a hoop. The stand can be obtained by a count and the weight and number of kernels can be obtained by threshing a small sample taken from the area within the hoop.

If time permitted I should like to discuss more generally the possibilities of objective methods of estimating the yields of other crops. One observation must be made before leaving this topic, at least -- we must make up our minds as to whether the sample data are to be used as a basis for a forecast or an estimate and plan accordingly. At present there is a marked tendency to make the observations as other matters permit and not at the time the crop is in a certain stage of growth.

THE POSSIBILITIES OF OBJECTIVE METHODS
OF FORECASTING YIELD PER ACRE

There is little need to point out to this group the importance of increasing the accuracy of the Bureau forecasts of yield per acre. We all appreciate the fact that accurate forecasts of crop production are essential to the success of agricultural programs, and that they are urgently needed by farmers and the public in general in making plans for the future. In looking ahead we can expect an even greater demand, not only for a tightening up of our methods of forecasting production, but also for greater geographic detail and more information about the underlying causes of the changes in crop prospects. The Agricultural Adjustment Administration, because of its crop insurance activities, is interested not only in the total production but also in information regarding the soil moisture situation, stages of growth, etc.

Probably we all agree that the farmer's opinion of crop prospects expressed as a condition has generally been a reasonably efficient basis for making a forecast of yield, especially late in the season. We also know that the condition figure has occasionally failed to give a good indication of yield. For certain specialized crops the reported condition has actually been inversely correlated with yield -- potatoes in Maine, wheat in Maryland. When these situations occur we are at a complete loss to know whether deviations from the regression line were due to (1) poor judgment on the part of the farmer, (2) a willful misstatement of the situation, or (3) a poorly distributed sample.

I can see that the forecasts of yields might be improved by developing new techniques of analyzing the conditionfigure; or present methods of analysis might be improved by including in the correlation, as an independent variate, such factors as precipitation and temperature, which may not have been properly evaluated by the farmer. But because of the limitations of the conditionfigure itself, it would seem highly desirable that independent objective methods of forecasting yield be thoroughly investigated, not only for the possibility of supplementing the indications based on the condition, but also of giving the Crop Reporting Board an additional leg to stand upon in the unusual years when the condition figure is thought to be unreliable.

It is true there are many ways in which the Bureau can go about the task of gathering data that will afford an <u>independent</u> basis for making a forecast of yield, but there are only two kinds of basic figures that afford a basis for making such a forecast. These are (1) observations of the environment of the plant, such as meteorological factors or soil moisture, and (2) structural counts and measurements of the crop itself. The possibilities of these two approaches will be discussed separately.

OBSERVATION OF THE PLANT'S ENVIRONMENT AS A BASIS FOR FORECASTING YIELDS

Since weather is sometimes an important factor in causing a year-to-year change in yield, it is thought that if we knew accurately the effect of weather, the problem of forecasting yield would be solved. This is not entirely true, of course, because there are many other factors contributing to year-to-year change in yield, such as method of cultivation, varieties, use of manure, amount of weeds, diseases, etc. These factors might be, in part, constant from year to year and might, in part, average out over all the fields of a state. Through subsidies the farmers are increasing the practice of terracing on sloping and eroded fields. Farmers are constantly changing the methods of preparing the soil, schemes of rotations, and varieties grown. In fact, to say there is no change in these factors from year to year would, in a sense, be saying that all the scientific work in agronomy and related sciences, as well as changes in economic factors, are not having an effect, or at least no more than a slow effect, upon agriculture. But can anyone claim that the large shift to hybrid corn during the last two years was a slow and insignificant change?

If research should disclose the fact that variations in weather are the largest contributing cause of variations in yield, there would yet remain the practical problem of obtaining an adequate description of the crop weather. We should lay plans for determining what weather measurements can best be used in connection with yield forecasts and how many observations of a given phenomenon are needed over a producing area.

CROP MEASUREMENTS AS A BASIS FOR CROP FORECASTING

It is probable that there are several measurements that can be made on a growing crop which will be correlated with final yield and consequently will afford a basis for a forecast of yield. But it is not known which measurements are most suitable for forecasting under commercial conditions. This can be ascertained only by studying the whole progress of the crop's growth. Unfortunately very few data have been gathered, either on an experimental or a commercial basis, that will permit the drawing of definite conclusions as to the possibilities of forecasting yields from crop observations. The data collected by the cotton section and data collected in England on wheat, in conjunction with the British Crop Weather Scheme, suggest possibilities.

On the other hand, I question that crop measurements alone will in all cases give the best basis for a forecast of yield. Even though the plant has integrated the past environmental conditions, numerical expressions of growth, such as height and stand, may not in themselves give any indication of other existing factors that should be considered in a forecast. To illustrate, I would be inclined to believe that the odds of having a high wheat yield in Kansas are materially different if there is an 80 per cent stand on June 1 with the soil only 40 per cent saturated, than if the soil was 80 per cent saturated. There is a multitude of other factors, such as plant diseases, insect pests, etc., which may not be reflected in plant counts, and a predicting formula calculated solely upon crop measurements will fail in predicting the yield according to the importance of these factors. It would seem to me that the crop measurements should be supplemented by objective observations of at least some of the other important factors such as soil moisture, presence of plant diseases, etc.

There are several ways in which the Division can go about developing more objective methods of forecasting yield. Among these are (1) observations made by the growers and (2) observations made by personnel who are trained in agronomy and the related sciences. There is a distinct advantage in the latter approach. First, the method of selecting the farms and units within the fields would not be restricted to voluntary observers. Second, the observer would be constantly on the job to detect factors coming into the picture that might not have been considered in a pre-assigned set of observations. Third, a sampling technique could be employed that also would give an indication of abandonment, which is an important factor to be considered inforecasting yields based on a planted acreage.

SUMMARY

There will probably be a growing demand for increasing the accuracy of the Bureau's estimates and forecasts of crop yields, and also for estimating yields in more geographic detail. On the other

hand, the subsidies on yield per acre, and other factors coming into the agricultural picture, are rendering the farmers' reported figures less dependable. It is therefore essential that more objective methods of sampling be developed which will be independent of the farmers' statements of the situation.

The Bureau can make an estimate of yields based upon figures that are independent of the farmers' statements by obtaining a sample of the standing crop just before harvest, or by using in a predicting formula the factors, such as weather, which constitute the crop's environment. Of the two approaches, the latter method is probably less efficient.

There is apparently no fundamental difficulty in obtaining an unbiased estimate of yield based upon samples of the standing crop before harvest, provided all the attributes of yield can be definitely defined and thereby permit the use of an objective sampling technique. But research is needed to ascertain the most efficient size and shape of sampling unit that should be used, as well as the most efficient method of selecting the fields and the location of the sampling units within the fields.

More objective methods of forecasting the yields can be based upon (1) factors that constitute the crop's environment and (2) observations of the growing crop. Since each method is probably not sufficient in itself, the best forecast will probably involve both types of observations. Even then, the Bureau will have to be constantly on the alert to detect other factors that may come into the picture and that may not have been considered in any pre-assigned set of observations.

DEVELOPMENT AND USE OF LIVESTOCK CHECK DATA IN FIELD OFFICES

George A. Scott,
Statistician, California

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I shall discuss very briefly the use of certain check data which have been of value in our livestock work. Among the more common kinds of check data being used in field offices may be mentioned assessments, assessors' enumerations, market receipt records, B.A.I. records, railroad forwardings and receipts, slaughter records, and brand inspection records. Many other series are available in some states, such as data compiled by federal credit agencies, those resulting from disease eradication programs, imports into states as compiled by state authorities, data made available through studies by colleges and experiment stations, and others.

Before entering into any discussion of the virtues or shortcomings of any particular set of records, I desire first to emphasize the limitations and hazards in all such check data emanating from sources outside our own offices. Normally, we have little or no control over the character of the original material, or of the manner of compiling it. Experience with many records of this kind in several states has taught me to look with suspicion upon all of them, whether or not they are in agreement with our own estimates or ideas. Before we are in a position to properly appraise the value of material obtained from outside agencies we must take the time and patience to ascertain in detail how they were originally obtained, under what conditions, from what sort of records or forms, the chances for error in putting the material together, the amount of completeness, and other conditions which influence the character of the data themselves.

The necessity for becoming familiar with the source and character of such information may be illustrated by citing a few instances where records have been misleading in the past. For example, a great many states make use of market receipt records of livestock as a more or less complete measure of livestock disposals. But we find in many cases there is much duplication between markets in recording receipts of livestock; there are differences in the practices in making allocations as to state of origin of stock where feed-in-transit shipments are involved; and marked differences exist in the proportions of stock from any particular state which flow into a certain group of markets from which records are obtained. Unless, then, a series of market receipt records for a certain state are appraised in light of these possible discrepancies, their use in accurately checking estimates of net disposals may be seriously limited. Again, records of forwardings and receipts of livestock, as reported by railroads, are widely used in

many of the Western States as a supplementary check upon in and out-movements. These records have in the past given us a great deal of trouble, particularly because we were not entirely familiar with the character of the data themselves. In the first place, many errors have been made in railway offices in compiling the material -- entries made in wrong classes, forwardings listed as receipts, and confusion in listing shipments by station of origin in which feeding-in-transit movements have a part. Stated destinations of shipments in some railroad records have been rendered valueless because of diversions and consolidations of shipments. Again, brand inspection records, ordinarily accepted as accurate, have been found to be extremely misleading because we did not know enough about the methods followed in compiling them.

In the normal course of utilizing such records, we are quite likely to entirely overlook their faults and limitations, especially when they are charted against other data, because they do not usually carry qualifying statements explaining the limitations or discrepancies in the material.

In saying these things, I do not wish to leave the impression that I condemn the collection and use of material that originates in other agencies, but I do want to emphasize the absolute necessity of knowing the characteristics of such data. It is only with this knowledge that we can hope to make intelligent use of such figures.

It might not be out of place at this point to discuss in a brief way the use that has been made of this class of material in the California livestock program. Only a small proportion of total livestock marketed in the State passes through public markets, and it is impracticable to obtain complete records of livestock receipts from slaughter establishments. Records of forwardings and receipts of livestock by stations have never been available for the State because one railroad company refused to supply such data.

In view of these conditions, other means were sought to obtain information that would show the disposals of livestock from ranches and feedlots in the State. Records of carlots of cattle and sheep that were being shipped into and out of the State were arranged for by the Cattlemen's Association and the Wool Growers' Association shortly after 1920. These records were not handled systematically and were of limited value because of many discrepancies. Similar records covering inshipments of hogs were begun by the Market News Service office at San Francisco about the same period. These records were, of course, of considerable value in throwing light on the volume of stock moving, but left the picture incomplete. Another approach was afforded through the fact that the state, county and cities were beginning to make slaughter inspection compulsory over a large part of the State. Records of slaughter in the two metropolitan districts were compiled by various agencies for some years, but important sources of slaughter records outside these districts had not been utilized. After considerable personal contact work, we were able to bring together records of all inspected slaughter under federal-state, county and city inspection agencies. Later State laws governing livestock slaughter were made

more stringent, and by working with the State officials who enforce these laws we now obtain monthly records of inspected slaughter from all sources. These combined inspection records cover more than 90 per cent of all cattle and sheep slaughtered, and more than 85 per cent of all hogs and calves slaughtered in the State, including farm slaughter. Through these means, we have substantially complete and accurate records of total disposals of meat animals in the state.

Two other sets of records enable us to derive the number of California animals that are slaughtered monthly. The first of these consists of the records maintained by the Brand Inspection Service of the State, now called the Livestock Identification Service, which show the number of cattle and calves brought into the state for immediate slaughter monthly by states of origin. The other record referred to is the check obtained by the state covering inshipments of sheep and lambs for stocker and feeder purposes. Additional records for hogs are not badly needed because practically all hogs coming into the State are brought in for immediate slaughter.

It may be seen, therefore, that by using this material from various sources, we are able to show the total number of animals that come into the state by states of origin monthly, classified as between animals for immediate slaughter and stockers and feeders, as well as to derive the number of animals of California origin slaughtered monthly.

The use of these records of shipments into the State has not been confined to California, because they have made it possible to furnish to those states shipping livestock to California the numbers of cattle, sheep and hogs disposed of through California outlets. In no other way would these records of disposals be available. These monthly records of disposition of stock from other states are extremely useful, because of the large numbers of animals involved.

I shall only briefly mention some of the difficulties encountered in getting these various records in shape. At first the railroads were careless in reporting; they made mistakes in showing sheep and hogs in cars instead of decks, in double decks instead of single decks, in giving states of origin, and at times in wholesale omissions. However, after contacting officials who made these reports, it was found that they were anxious to make their data as accurate as possible. Since each railroad company abstracted the data for its monthly report of livestock shipments from a different set of records, it was found that there was some duplication in the combined records of inshipments, offset in part by an important omission from another source. These discrepancies have been corrected after considerable consultation with the railway officials. Errors also were frequently found in records of the Brand Inspection Service, and even in the records of inspected slaughter. Considerable difficulty was experienced in converting the cars and decks of stock to numbers of head. Different conversion factors were necessary for each state, and variations in numbers shipped per car were extremely disturbing, since we had no satisfactory base for checking them. For this reason, arrangements were finally made with the railroads to obtain records of livestock enroute to California

serviced at six main feeding points, these records showing both numbers of cars or decks and corresponding numbers of head. In this way we can compute the monthly average per car or per deck for each state contributing to the movement of stock to California.

It cannot be claimed that the records we are now receiving from railway companies are free from mistakes, but we believe they show the numbers of livestock shipped into the State with reasonable accuracy for all the important contributing states. Some criticism may also be lodged against the Brand Inspection records, and even the slaughter records are subject to some error, but they are more complete as inspection requirements become more rigid and inclusive.

With these various data available covering a series of years, we have been able to set up annual balance sheets for cattle, sheep and hogs, using with them our estimates of natural increase and death losses. These provide us with an independent series of indications of changes in numbers of livestock. In view of the difficulties we normally experience in obtaining samples that are entirely reliable for this purpose, we have come to place a great deal of reliance upon these balance sheet indications. The use of check data, then, has been almost invaluable in our livestock reporting program in California.

At this point, I desire to digress somewhat from the main topic and state that I believe that tentative balance sheets form one of the most useful approaches that we have in estimating changes in numbers of stock and in the total output from year to year. A series of tentative balance sheets covering a period of years often reveals weaknesses in our estimated items or in other records, and generates an urge for further study of material being used in calculating income and value of production estimates.

Little need be said about the possibilities of expansion in the use of check data in the field, other than that we should be continually on the alert to unearth material of this kind, to bring it together, to appraise it, and make such use of it as its value warrants. While our men are alert to possibilities of this nature, I believe there have been instances where we have been delinquent in properly evaluating check data, because we did not or could not take the time necessary to thoroughly familiarize ourselves with the fundamental characteristics of the data being used. It is not enough to discover the peculiarities of this material, but it is necessary to keep more or less continually in touch with the sources that make it available, because of changes that often occur. Indiscriminate use of material from outside sources is not only a waste of time and funds, but it brands the user as a "sucker".

DEVELOPMENT AND USE OF LIVESTOCK CHECK DATA IN FIELD OFFICES

Frank E. Finley
Statistician, Texas

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In Texas, our railroad records date back to 1925, and in handling returns from approximately 1,500 railroad stations the work involved is tremendous. However, we feel that our labor is not in vain, as these shipment records serve as a basis for many of our reports on Texas livestock.

All livestock shipment reports are made from individual stations on special forms provided for the purpose. All station agents are supposed to mail their reports covering all livestock shipped from their station for the preceding month, not later than the 10th of the month following. All of you are familiar with schedule returns, and know that some of these agents will fail to remember to mail their reports on any specified date. Consequently, it is necessary for us to mail a "tracer" to each agent that has failed to send in his report by the 10th of the month. The number of "tracers" usually mailed on the 10th of each month will average about 300. This "tracer" usually brings results, but we only give the agent one week, and then a second "tracer" is mailed, to usually about 30 stations. By the 25th of the month, an average of about 10 stations are still delinquent. These few stations are turned over to the Division Superintendent, who always gets prompt results. Before the next report is compiled we have received a 100 per cent return.

These railroad records are used in many ways:

1. They serve as a partial check on livestock production within the State, and as a partial basis for the January 1 estimates on numbers of livestock.
2. They give monthly records of marketings, and serve as a basis for estimating marketings for given periods.
3. They give us records of direct rail movement of wool and mohair.
4. They have served for numerous publications on long-time records of livestock shipments from Texas.

Due to the fact that the bulk of the wool and mohair produced in Texas moves direct by water, it is necessary for us to use quite a different method of securing check data for these two commodities. During the past few years, we have had very friendly relations with the officials of the various steamship lines operating out of Texas. Each year, during January, a representative from our office visits the division office of these steamship lines to tabulate the wool and mohair

handlings as shown by the manifests of each company. Most of the local offices of the steamship lines have already compiled the gross tonnage of wool and mohair combined that they have handled during the year, but to get a complete separation between wool and mohair, it is necessary for us to go back to the manifests. However, this procedure has its distinct advantage, as we are able to check the figures compiled by the steamship companies, as well as our own compilations.

While this information is confidential, we give each line a copy of the total handlings of all companies, for their information. Individual reports are treated as other confidential information secured by this office.

Check data have certain "pitfalls" that must be watched for. In the case of our check data on wool and mohair, the records are almost perfect when there is no carry-over. When the carry-over is large, as this year, it is essential to get reliable estimates on wool and mohair stocks. This year we must have fallen into one of these "pitfalls", but we believe now that Mr. Harlan pulled us out. If he didn't he stepped on us, and we will both have to be pulled out next year.

It might be of interest to note that in following wool production "check data" we have apparently followed the change in numbers of all sheep on Texas ranches, as it was not necessary to revise sheep numbers materially following the 1935 Census.

DEVELOPMENT OF LIVESTOCK CHECK DATA IN IOWA

C. D. Palmer
Associate Agricultural Statistician

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Livestock check data in Iowa consists of marketing records, assessor's enumerations (both taxation and statistical) and feeding cattle and sheep import records.

The only really adequate check data on livestock in Iowa are the records of monthly marketings at interior packing plants, concentration shipping points, and terminal markets. For cattle, sheep and hogs the marketing records are valuable for estimating income, and as a balance sheet indication of per cent change. For sheep the total marketings in the first four months in the year are the check of January 1 numbers of sheep and lambs on feed. For hogs, the total marketings from January to September are used as a check on January 1 numbers, and crop year marketings are used as a check on the pig crops.

In the case of cattle on feed, several years ago Mr. Harlan devised a formula with which the Corn Belt Statisticians, at least, are familiar, for checking the April 1 numbers of cattle on feed. This formula was based on marketings of beef steers from April 1 to November 1 at Chicago. Estimated percentages of beef steers to all cattle were applied to marketings at other points.

In order, however, to get an adequate check on numbers on feed, it would seem that some comparable information is needed about the direct purchases by large interior packers. This is true not only because their volume shows a large increase, but also because they may be buying a different proportion of the various classes and grades of cattle. The problem of cooperation, and maintaining grade classification comparable with Chicago would be difficult at interior packing plants. However, if information on numbers of cattle marketed by grades similar to Chicago was available for Sioux City and Omaha this combined check on marketings would probably furnish a fairly adequate check on numbers on feed when combined with other indications.

LIVESTOCK ASSESSED

The continuous record of numbers of livestock on Iowa farms assessed for taxation by classes runs back to 1848. There have been some changes in classes assessed but since 1925 the cattle classification has been divided into all cows, all heifers, all bulls, steers two years plus, steers one to two years, and cattle in feeding. The cattle on feed January 1 when assessed as such, carry a slightly higher rate than those assessed as steers. Crop Estimates definitions for cattle on feed January 1 would include about twice as many as the number assessed.

Attempts have been made to explain changes different from other indications, by conference with the State Board of Assessment and Review, but

they know little about the figures except to take the totals as reported by the County Auditors. If county estimates are necessary for a period of years these county totals of Assessments should be very useful for cattle, horses, mules, and perhaps sheep.

In addition to the taxation figures on livestock, the Assessors have enumerated spring sows (farrowing between December 1 and June 1) since 1919. For January 1, 1935, this total was 1,000 less than the federal Census and, of course, also contains an element of intentions but are apparently about complete.

Since January 1, 1936, the Assessors have enumerated all horses, all mules, all cattle, all sheep, and all hogs on farms with the statistical enumeration of crops. Incompleteness by classes varies a great deal; horses being about 8% less than the Board total, mules 20% less, cattle 10% less, sheep 35% and hogs about 25% incomplete. In addition to the taxation bias there is some incompleteness due to time of enumeration.

INSHIPMENTS

The need for economy accompanied by an increase in the truck movement made railroad records less indicative of the total livestock movement than in the early 1920's. This report was abandoned for Iowa in 1929. Lack of rail loading records is no particular loss in Iowa because of the rather complete check of marketings from slaughterers, concentration point buyers and terminal markets.

For many years, the Iowa State Division of Animal Husbandry has kept records of livestock entering the state "under quarantine" or "special permit". Prior to the calendar year 1934 these records were so incomplete that little reliance could be placed in the monthly totals to indicate either the direct or total in-movements. Since January 1934 these records while still incomplete are believed to be worth while indications of the in-movements of feeder sheep and lambs and cattle. The amount of incompleteness in the State permit records is not known but is probably around 20 per cent.

Another approach the past fall was to obtain records from large importers of feeding lambs. Considerable personal contact is necessary to obtain these records. Some contacts have been made with sales barns of which there are about 250 in the state. There is a tendency for these outfits to scalp off the markets and have few direct imports. They generally keep rather poor records.

Our studies of both the Assessor's taxation figures and the State Veterinary records indicate that it is very important to contact those responsible for compilation of the records and scrutinize the data rigidly when the collection and tabulation of information is by agencies outside our own organization.

DEVELOPMENT IN THE USE OF CHECK DATA IN FIELD OFFICES

B. U. Kienholz,
Statistician, North Dakota

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GRAIN

In North Dakota the most valuable check data are (1) the assessor's enumerations, and (2) the crop check. Our state assessors collect the current planted acreages and the historic harvested acreages of crops. Production data are also obtained for wheat, rye and flax. The current data necessarily contain some element of intentions, at least for the early seeded crops. The enumeration has been about 80 per cent complete. We adjust the data for each county by the relationship that existed between the assessors and Census enumerations for all farms and total land in farms for the most recent Census year. We have come to feel that this type of check is almost indispensable.

The idea of using a crop distribution check originated in 1915. My information leads me to give Mr. Kirk the credit for developing and using this check, at least insofar as it applies to cash grain.

The use of this check in recent years up in North Dakota has been complicated by the long-continued drought and the abnormal conditions which have developed as a result. Since the check is made up of data relating to shipments to market, amount of seed used for the succeeding year, amount fed to livestock, amount used in the home, stocks on hand in mills and elevators, and on farms as of July first of the current year less stocks on hand a year ago, we can readily see that the results of the check itself are not a 100 per cent indication of what the final production was. In the past few years many of our farmers have been short of seed grain. Considerable amounts have been shipped in from surrounding states, or thought to have been. We have had no satisfactory way of knowing just what proportion of the seed supply was met by the local crop and how much was shipped in. "Fed to livestock" is another item which has caused trouble in some of the recent rust and drought years. While an inquiry is made in March and again in July concerning the amount of wheat fed as a percent of the total crop, our estimate may still be far enough off to make an appreciable difference in the indicated total net crop. Estimates of "stocks of grain on farms" are also based on sample data and, of course, are subject to a certain degree of error. The "stocks in mills and elevators" item is based on reports received from the State Railroad and Warehouse Commission. All elevators are required by law to make reports monthly to this state agency. We believe that this item of the check is very accurate.

The estimated amount of wheat used on the farm as flour is based on reports received from local mills as to the amount of grain

received direct from farmers to be ground as flour. Most of the active mills make these reports -- probably 30 or 35 in all -- and we think we can make a fairly accurate allowance for the mills which fail to report. In any event, since the amount of wheat used in this way is relatively small, the error would not be of much significance.

Even in what we choose to call normal years up in North Dakota, the estimates on seed used probably involve some error. We estimate that bushel and a quarter of seed on the average is used per acre. This figure is applied to the preliminary acreage estimate for the following year to arrive at the quantity used for seed. Ordinarily this estimate should be fairly good. As pointed out previously, however, the estimates during recent years may have contained a greater error than usual because an unknown quantity of seed was imported.

With regard to the form in which the railroad shipment data come to us, we have five railroads operating in the state -- the Great Northern, Northern Pacific, Soo, Milwaukee and Northwestern. Some report shipments in tons, some in bushels and one in cars. We believe the figures submitted are very accurate. We have made no effort, however, to allow for cross-state movement, assuming that this tends to balance out. There probably is some duplication in the shipment records also, a few of the short branch lines transferring cars to other roads where necessary. However, we assume there is very little of such duplication, since the four roads handling the bulk of the shipments all terminate at our principal markets.

I have made a calculation which might serve as a measure of the possible error in the crop check. This is wholly the result of my own opinions and knowledge of the data involved. I have taken the 1924 wheat crop as an example. The 1924 crop check data are given below:

		All Spring Wheat (in thousand bushels)
Railroad Shipments		120,171
Mill and Elevator Stocks July 1st Current Year		7,675
Stocks on Farms July 1st Current Year	4%	5,309
Mill Receipts		2,600
Required for Seed		11,505
Fed to Livestock		2,002
TOTAL		149,262
Stocks in Elevators July 1st Previous Year		5,559
Stocks on Farms July 1st Previous Year		1,785
Canadian Wheat		5,000
TOTAL		12,344
Net Crop		136,918
Final Estimate		132,715
Census Production		123,010
Revised 1932		Same as finals
June 1936 Revisions		132,715

The first item involving an estimate is "farm stocks of grain". For the sake of argument, we might assume that this estimate contains a 20 per cent overstatement which would amount to 1,062,000 bushels. "Mill receipts" should not be off more than 10 per cent, or 260,000 bushels. "Required for seed", possibly 8 per cent, or 920,000 bushels; "fed to livestock", 20 per cent, or 400,000 bushels, making a total of 2,642,000 bushels if all the error was in the same direction, which is not at all probable. This total represents only 1.6 per cent of the net crop indication for that year, certainly not a serious error. Of course, in years of short crops, such as 1934 and 1936, a large cumulative error would constitute a rather large per cent of the estimated crop production, but the probabilities are pretty much against any likelihood that the errors are all in one direction.

We feel that the crop check has kept our cash crop estimates pretty well in line with the facts, and we wouldn't care to dispense with its use unless there was some other equally good method to use as a substitute.

THE USE OF CROP CHECK DATA IN GRAIN ESTIMATES

Jay G. Diamond,
Statistician, Montana

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The most important data on which annual revisions of wheat acreage and production are based is that afforded by the crop check of wheat production derived from an analysis of railroad shipments, elevator receipts, mill and elevators, carryover, and certain other estimated disposition items including amounts used for seed and feed, farm carryover, and deliveries to mill-door, and wheat exchanged for flour.

The total net amount of wheat thus accounted for as representing the production in any one season is a direct check against the Board production estimate for that year. When divided by the Board harvested yield per acre the data gives a further check against the Board estimate of harvested acreage.

In states where both winter and spring wheat are grown, it would be desirable to have a breakdown in the crop check data as between these two kinds for a closer check on the acreage and production estimates. With such a thought in mind, the grain division of the Montana Department of Agriculture, as early as when Mr. Beier was State Statistician, required mills and elevators reporting annually their receipts of wheat for the crop year to break down these receipts into winter, durum, and other spring wheat. However, the larger line companies were unable to make such a segregation with the result that the amount reported unclassified or as "all wheat" was so large a part of the total receipts as to weaken the value of the data for a breakdown comparison with Board estimates.

However, for the purpose of checking production and harvested acreage of all wheat the crop check has worked out very satisfactorily, and with the single exception of 1934 has been quite comparable with the production as reported in census years.

It might be well, at this point, to discuss briefly the actual and estimated items that go into the wheat crop check. Among the known quantities we have the following:

(a) Railroad Loadings:

The Montana Railroad Commission requires monthly loading reports of all carriers for all commodities, from which we compile our crop year total for all roads. In case of the Great Northern, the general freight and passenger agent at Helena gives us his own tabulation of both cars and bushels. Other railroad division freight and passenger agents estimate for us the average loadings per car for their lines, from which we derive a figure to apply to total carloadings.

(b) Elevator Receipts:

The Grain Division of the State Department of Agriculture requires mills and elevators to report annually the total amount of wheat bought or handled through, classified as to kind. In some seasons there is a small amount of incompleteness in this data due to failure to report, which can be estimated from the capacity of the total number of houses licensed each year in relation to the number reporting receipts.

(c) Elevator Stocks:

Montana mills and elevators are also required to report the amount of wheat in storage and in transit on the first of each month. Like total receipts this item in some years is subject to a small error for failure to report.

(d) Imports:

In 1936 when Montana's wheat production did not afford a sufficient supply of wheat for local milling needs, there were considerable imports from Canada and from other states. For that year certain railroads furnished the station receipts of wheat at milling centers that came in from outside sources. We also obtained from the customs service the imports from Canada and two of the largest mills gave us, confidentially, the exact accounts and origin and disposition of their imports. Ordinarily the amount of wheat shipped into Montana from other states is negligible. However, in case of Canada in past years it was necessary to allow for both wheat smuggled into Montana from Canada and at times for wheat smuggled from Montana into Canada. This item in recent years has almost disappeared from our crop check, due to the operations of the Border Patrol of the Customs Service.

(e) Wheat Exchanged for Flour:

At one time, under a law regulating the amount of flour that can be exchanged for wheat by local mills, the State collected annually the statistics for wheat exchanged for flour. During the period for which this data was available the annual figures showed little variation from the round total of half a million bushels. The item is now estimated at somewhat below that figure.

ESTIMATED DISPOSITION ITEMS OF WHEAT CHECK

The estimated items in the wheat check are as follows:

(f) Amounts of Wheat Used for Seed:

This item is usually based on acreage seeded times 1.0 bushel. In case of winter wheat, the seeding rate is of course higher than this figure but in case of spring wheat in the dryland areas, rates as low as 40 pounds per acre are common. Surveys of seeding rates have repeatedly supported the figure of 1.0 bushel as an average. More important than the rate per acre is the question of how much wheat farmers buy as seed from elevators. In years of normal, or had we better say average crop conditions, the large bulk of our farmers retain their own seed. Under these conditions ordinarily it is not necessary to allow for seed bought from elevators. However, in 1937, in view of the large importa-

tions of wheat and the known fact that many farmers by successive years of drought were without seed wheat, we found that we could not reconcile the crop check data based on elevator receipts with that based on railroad receipts unless we assumed that farmers had bought at least 25 per cent of their seed requirements from elevators. On December 1, we added a question to our regular crop schedule asking what per cent of the wheat used for seed in your locality for 1937 crops was purchased from elevators? District percentages in the drought areas ranging from 53 to 80 per cent confirmed our crop check allowance, although the survey indication for the State at 53 per cent was obviously too large.

(g) Wheat Fed to Livestock:

This item was formerly based on crop reporters' reports for their locality which inquiry was carried on our March schedule. This year it was moved up to the February schedule and asked on the basis of wheat fed on the reporter's farm. The latter basis this year resulted in a considerably lower percentage figure compared with March a year earlier confirming our suspicion that the older form of inquiry tended to overstate wheat fed to livestock.

(h) Farm Carryover of Wheat:

Since this inquiry was placed on actual farm reports several years ago, we believe we are getting good estimates of farm stocks.

(i) Mill Door Receipts:

This item does not enter into railroad shipments and has been allowed for in our crop check for many years. While an estimated quantity, it has considerable stability from year to year and is used to reconcile the elevator crop check with that based on railroad receipts.

(j) Wheat Exchanged for Flour:

This item, now an estimated quantity, was discussed as item (e).

While the wheat crop check data converted to acres lends itself readily as a check against board estimates of absolute acres, like all crop check data, it should be analyzed as a percentage change from the preceding year. In this way it can be readily compared with other acreage indications. The data may also be plotted either as actual acres or percentages along with other acreage indications for chart studies of acreage changes.

Although considerable reliance can usually be placed on the crop check itself, any radical difference with the other indications should be examined closely before the crop check is used as the basis of revision.

As indicated earlier in this discussion, had the crop check data been literally interpreted in case of the 1936 crop and without correction for wheat imports, both the railroad loadings and the elevator receipts as reported would have been grossly misleading, since both included wheat originating outside Montana and in case of the railroad loadings, investigations showed that considerable amounts were re-exported.

A new factor in the crop check, developed during recent years, is the truck movement of wheat. During the 1936-37 season we found actual truckings of 65,789 bushels. In addition we located some Idaho wheat that because of Montana protein premiums came from eastern Idaho into West Yellowstone (Montana) and thence into Bozeman.

The crop check is a valuable aid to the statistician, but like all indications it must be related to and studied with other data. Like other indications, furthermore, after years of reliability and dependence it may suddenly take a wide departure from the other data. Such a case occurred in Montana in 1934 when the crop check overran the census production by more than 6,000,000 bushels. While we did not take the crop check at face value that year, I feel that in view of our experience last year a more thorough investigation as to the reason for the difference might have brought about a closer reconciliation between the two sets of data.

CONCLUSION

The general public, using our estimates, dislikes our annual revisions and it is difficult to explain satisfactorily the theory behind annual revisions which seek to prevent cumulative error of estimate. One of the criticisms expressed to me by a well-informed user of our data is that, "if on review of the indications a year later, we can get a better figure, what was the matter with our interpretations of a year earlier?" My reply has always been that new data has since become available and especially crop check data. This answer seems to be satisfactory.

There are many crops besides wheat for which crop check data is available and there are probably crops in many states for which new check material could be developed. My thought on this matter is that crop check data should be developed wherever possible and that more disposition data and utilization data (which we might term sample crop check data) should be developed and considered along with our other material used in crop revisions. The new farm income estimates will require more adequate sampling of disposition and utilization of crops. Besides improving the basis for farm income estimates, the additional disposition data, or sample crop check, has a very definite place in regular crop estimates work.

DISPOSITION RECORDS USED AS A CHECK OF THE KANSAS WHEAT CROP

H. L. Collins,
Statistician, Kansas

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The work of assembling wheat disposition records for Kansas was started in 1932. It was recognized years ago that Federal Census and Assessors Enumerations of wheat acreage in Western Kansas and particularly the southwest were incomplete. This has always been true because extensive acreages in that part of Kansas are handled by absentee operators who are in the county only for brief periods at seeding and harvesting time and are not to be found when the enumerations of acreage are taken. In 1933 Mr. F. K. Reed, then Kansas Statistician, completed the wheat disposition records for the five crop years, 1928 to 1932. These data were of material value in revising our state estimates and in making revisions of county wheat acreage and production estimates for use of the Agricultural Adjustment Administration. The disposition records have been assembled each year and at present are quite complete for the nine crop years, 1928 to 1936. The disposition study includes only the western two-thirds of Kansas. The eastern one-third of the State has produced an average of only about ten per cent of the State's total wheat crop. In addition, it is difficult to secure a record of disposition in eastern counties and for comparative purposes we have added the production estimates for Districts 3, 6, and 9 to the total as shown for disposition records for the balance of the State, and have secured a total disposition figure for the entire State. The items entering into the disposition study are:

1. Railroad Records:

The record of forwardings of wheat from all Kansas stations have been completed for the nine crop years from June 1, 1928 to June 1, 1937. The record of cars of wheat forwarded from Salina, Hutchinson and Wichita are excluded from our rail total. These are large milling centers and the wheat forwarded from these points is considered as reshipments. We have never assembled a record of wheat received, as the Santa Fe system combines wheat received with other grains under the general heading "all grain" received. There is need for a record of wheat received by rail, particularly in years of low production when wheat may be imported from other states for seed or milling purposes. As already indicated, however, records of wheat received by rail at mills and re-shipped are available so those points which comprise most of the receipts are taken care of. In addition, a considerable part of the imported seed wheat moves in by truck and this would not be included in the railroad records.

2. Mill Door Receipts:

All mills operating in Kansas have been solicited by schedule or personal visit for information relative to mill door receipts and re-

shipments. The records now are complete for the nine crop years 1928 to 1936 for the western two-thirds of the State. Re-shipments at Wichita, Hutchinson and Salina are excluded as these are large milling centers and the cars of wheat forwarded from these points are not included in the railroad records.

3. Adjustment for Farm Carry-over:

Quantitative estimates of July 1 farm stocks have been prepared from survey data and have been used to adjust wheat disposition for change in carry-over.

4. Adjustment for Mill and Elevator Stocks:

The July 1 Board estimates have been used. Since these holdings are largely in the western two-thirds of the State the percentage of the State's total wheat crop produced in that portion of the State has been applied to the State stocks figure in adjusting disposition records for this item.

5. Wheat Used for Seed, and Fed to Livestock:

The amount of wheat used for feed and seed has been estimated by districts based upon information obtained from the general schedule.

6. Indicated Total Production:

The indicated wheat production for the western two-thirds of Kansas is therefore secured by adding together the wheat forwarded, that used for seed, for feed, mill door receipts, also farm and mill and elevator stocks at the end of the year. From this is subtracted the re-shipments of wheat from mills and the farm carry-over and mill and elevator stocks at the beginning of the year.

The Results Secured:

The disposition records range from 101.8 to 113.4 per cent of the production estimates now carried for the western two-thirds of Kansas. The highest percentage is in 1935, the yearwith the smallest production estimate of the nine years included in the series. The average disposition as per cent of production has been 105.8 per cent. There are a number of problems in connection with the use of this type of check data that have not been solved. We have the problem of movement across state lines withwhich very little has been done. For example, there are a number of rather important Kansas market points near the Oklahoma line where a considerable volume of Oklahoma wheat is received that is not offset by Kansas wheat marketed at Oklahoma points. In addition, there is wheat moving direct from farms to mills and terminal elevators in Wichita, Hutchinson and Salina that received no credit if it is shipped to other points. Practically all of this wheat, however, is milled locally and enters into the records of mill door receipts.

Although the check data assembled for wheat has not been a precise indication of Kansas production, it has been of very definite value in truing up our acreage and production estimates, particularly in southwestern counties where Census and Assessors' data are obviously incomplete.

DEVELOPMENT OF CHECK DATA ON BEAN PRODUCTION IN NEW MEXICO

Fred Daniels
Statistician, New Mexico

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Unfortunately we do not have an assessor's census onwhich to base our revisions. Railroad shipment records of crops have furnished varying data as to a check on estimates of production. Of our largest crops, wheat is the only one for which shipping records have been of any assistance as a check on estimates. In the case of wheat, the amount shipped by rail varies greatly from year to year, depending on the amount hauled by trucks, amount fed to livestock, and the change in rates for hauling wheat by rail. For broomcorn, railroad shipping data is an excellent check on production because only a small amount of the crop is hauled interstate by trucks. The amount hauled by trucks can usually be estimated closely by broomcorn warehouses.

Two seasons ago a study was made of the bean growing in the state in the hope that some information might be found that would assist in improving our estimates on this crop. Beans are grown widely over the state and possibly the per capita consumption is higher than in most states because of the large Mexican population.

Railroad records of the movement of beans have never been an accurate check on the production. The percentage of the crop moved by rail in any one crop year varies because of (1) changes in rail rates; (2) the amount moved by trucks; and (3) the holdover at the end of the season. The amount moved by truck varies according to the competition offered by railroads. The holdover of beans at the end of any one crop year varies greatly. In most cases, farmers are financially unable to hold a large amount from one year to another, causing the greater part of the holdover to remain in the hands of bean buyers.

From my own judgment, for this survey the state was divided into: (1) Commercial Counties; and (2) Non-commercial Counties.

A commercial county is one in which the largest proportion of the beans is recleaned at cleaning plants and shipped generally out of the state. A non-commercial county is one in which the major portion of its production is consumed locally. That amount of beans consumed locally rarely is taken to a cleaner for recleaning.

In New Mexico all beans shipped are recleaned, regardless of the efficiency of the thresher, and resacked in new bags. The farmer is paid on the recleaned weight and has the privilege of disposing of the amount of cleanings taken out of his beans. The percentage cleaned out varies up to six and seven per cent of the thresher run, but no attempt on the part of the farmer or cleaner is made to ascertain this amount.

In the fall of 1935 I visited as many cleaners as possible and discussed the possibility of securing, later in the season, the number of bags recleaned from the 1935 crop. In May of 1936 data on the number of bags of beans recleaned from the 1935 crop was secured from 29 cleaners. Most of this information was secured by personal visit, with only a small amount by correspondence. It was found that a personal visit is much more satisfactory. The total amount of beans cleaned up to this date, mostly from the seven so-called commercial counties, was 457,211 bags. In order that this data could be used as a check on the estimated production for 1935, it was necessary to let this amount equal the production from commercial areas and determine what percentage the commercial production was of the total state production. This percentage was determined on the basis of census data on acreage and production of beans in the previously mentioned seven counties which were considered as commercial producing counties.

U. S. CENSUS

	Acreage				Production			
	1919	1924	1929	1934	1919	*1924	1929	1934
% Commercial	65	78	73	50	68	---	74	66
%Non-commercial	35	22	27	50	32	---	26	34
Total	100	100	100	100	100	100	100	100

*Production not reported.

On the basis of the above division betweenthe so-called commercial and non-commercial counties, the commercial percentage production was adopted at 70% of the state's total. By letting 457,211 bags of beans recleaned equal 70%, the state production was indicated at 653,158 bags. The previous estimate for 1935 of 302,000 bags was later revised to 660,000 bags in December 1936.

The survey on the 1936 production was conducted in pretty much the same manner. The number of bags of beans recleaned at cleaners from the 1936 crop was 308,572. The estimate for December 1936 of 288,000 bags was revised in December 1937 to 441,000 bags.

Through the development of these check data based on beans recleaned, it has been possible to improve the production estimates of this crop. The accuracy of the check depends upon securing all beans recleaned, and the allowance this amount is of the total production for the state. This development of check data is relatively new in New Mexico, but with some improvement it is hoped that it will be valuable enough for use in connection with the next Census in revising the yield and acreage of beans.

THE OUTLOOK FOR CROP AND LIVESTOCK ESTIMATES

Walter H. Ebling,
Statistician, Wisconsin

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When one looks at the work of our Division, it seems that the future of the field must be viewed in its broad aspects. Our work is a subsection of very large fields. The broad field of agriculture, the broad general field of economics, and the rather extensive field of agricultural economics are backgrounds against which the work of the Division of Crop and Livestock Estimates needs to be projected. We form an indispensable service, widely and basically related to many aspects in these broad fields.

You all know something about the growth and demands for agricultural data. The great increase in the requirements for our material is not new to any of you. In my short time in this work I have seen the growth in the demand for agricultural statistics from a number of sources. In a conversation, Mr. Pettet recently made a statement to me that he thought that the demand for agricultural statistics had increased something like twenty fold in the time covered by his experience. Whether this measure of change is exact, no one can say, but in any case it is an expression that is probably quite reasonable.

Agriculture's "Intelligence Service":

The Division of Crop and Livestock Estimates has really become the "Intelligence Service" for American agriculture. I am indebted to Dr. Warren of Cornell for that expression. I once heard him use it in referring to our work at Chicago, and I have never forgotten it. Functioning as an "Intelligence Service", our place in this broad field of agricultural economics is well established indeed and the dependence of the field on our data is growing.

In order to meet properly the demands that come for our material, it is necessary that we keep a broad and general outlook. Only by rising above our detail and maintaining a broad outlook can we render that service so basic in agriculture. If it is properly done, our work becomes the most important single thing in the field of agricultural economics, and perhaps one of the most important of all the services rendered to agriculture. However, men cannot perform well this far-reaching service and have the broad outlook that is needed if they permit themselves to be immersed too much in detail. Anyone that is immersed to his hatband in minutiae cannot maintain much in the way of the larger outlook. Somehow the details must be organized and so handled as to give us some freedom for the larger view of things.

A Great Heritage:

We have a great heritage. Back of us lies nearly a century of work. Next year we will celebrate our one-hundredth anniversary, and this should be a memorable occasion. We should review the history of our development and gain a new appreciation of that great heritage for which we are now responsible.

I feel especially fortunate in the heritage which has come to me in Wisconsin. It was about 1914 that the establishment of field offices developed out of an original suggestion by Nat Murray. Since that time in Wisconsin, we had for a four-year period, Mr. Callander in charge of the office and he left a splendid trail of work, largely of the extensive type. He built a great organization and traveled much. He was followed by Mr. Becker, whose work, as I see it in retrospect, was of somewhat different nature. He was an intensive worker, developed office technique, and put to use the extensive machine which Mr. Callander had built. Both men traveled enough so that I am still asked about them in unexpected places. Mr. Becker was followed by Mr. Nyhus, who is now in foreign service, and who was still a different type of worker. He took the organization of Mr. Callander and through the intensive work of Mr. Becker sold it to the public, a task for which he was well equipped by virtue of his training in the Extension Service.

One of Mr. Callander's greatest contributions made in Wisconsin was the establishment of cooperative relationships with the state. This arose out of the needs of the war period, and it has been widely adopted. It was a basic contribution to the field of agricultural economics. It was when the office was in charge of Mr. Nyhus that much was done to acquaint the public with this important field of work and to establish it as a going concern of the state on a larger scale.

I was fortunate enough to inherit the sequence of work developed by those three men and it has been something of a job to try to carry forward and preserve what they built and to add on as later needs and opportunities came.

A Future of Promise:

As to the future of the work of this Division, I have no apprehensions. I face it with full confidence. If we keep a broad outlook in our work and see our great service in relation to the general field and its problems, we need have no apprehensions. Society as a whole, and agriculture in particular, are destined for a time at least to be more and more complex. With the growth of this complexity, the need for accurate and timely data will be greater than ever. These increasing needs will throw increasing burdens upon our organization. We should look forward to meeting these needs as they arise. In fact, with these newer needs of an increasingly complex agriculture lie our greatest opportunities. If our outlook is broad and our views extensive so that we can meet these needs as they arise, we have in them an assurance of the promotion of our work. If our material is needed urgently enough, some way will be found to provide us with the budgets which are needed to carry

it through. I know that many are apprehensive about budgets for our efforts but if the need for our material is great enough and the confidence in our organization remains high, some way will always be found to provide the budgets that are needed to carry on the work.

Yesterday I was very much interested in the discussion regarding the publication of our output. To me this is a matter of basic importance. I am indebted to a letter from Mr. Borum for the statement that the presentation of our work to the public is one-half our job. Obviously, we cannot spend half of our time on it, but it is nevertheless a matter of major importance. There is a great satisfaction in being able to write up the results of our data; in fact, figures by themselves, without interpretation, are dead things to most people. One of our opportunities in the future will be an increased amount of good writing in the form of bulletins, press releases, radio copy, or otherwise giving the public an interpretation of the material which we are constantly bringing together. As you work with this field, you may be surprised at the extent to which the habit of writing up material sustains you through the routine work that must be a part of the job. It is at once an opportunity and a challenge to so present the material that its benefits are really widespread.

I want to say again that I have no apprehension about the future of our work. I look forward to increasingly important developments for the entire data field in agriculture. Our opportunities and our responsibilities are large and I congratulate this excellent group of men upon the responsibilities which it now faces and will continue to face in the years to come. Our leadership has been excellent. The men in Washington have usually taken the larger view of things and if we can continue to see agriculture and the field of agricultural economics as a whole, we will be increasingly better able to carry that most interesting part which we, an "Intelligence Service", must play in it.

These remarks came into being quite unexpectedly. I was out of the room most of the afternoon and heard only the last part of Mr. Shepard's talk. Perhaps what I have said does not tie too well into what has gone before, but since I was called upon without warning, I have had to talk altogether extemporaneously of matters over which I have often thought. In closing, may I remind you that next year is our one-hundredth anniversary, and if we make the most of it, this occasion can be used to carry forward our field on its entire front. We never had a greater opportunity to present our output and publicize our efforts.

COTTON GROUP CONFERENCE

F. H. Whitaker, Chairman,
S. L. Bryan, Secretary.

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The more important points only are covered in these minutes. The plan of decentralization was discussed and explained. Mr. Harrell's paper, "A Brief History of the Cotton Records," was presented. Full discussion was had on how to build up the crop reporting list in order to receive a representative sample. It was finally decided to use the Cotton Condition Reports and the weights as a guide. The dispersion is to be determined by districts, the decision being reached that districts having a higher weight should require a lower relative probable error of the mean than those having a low weight. For instance, in Arkansas, District 2 had a weight of only 28 out of a thousand, so it was decided to allow this district a relative probable error of 2.0 per cent. District 6 in this state had a weight of 258 out of a thousand; therefore, this district was allowed a relative probable error of the mean of only 1 per cent. Using this as a basis, the amount of error to allow the other districts was then determined. This was done by chart analysis. The Relative P. E. of the Mean allowed the other districts varied between that allowed for District 2 and District 6. Using the relative probable error thus determined, the number of reports needed by districts was then computed by the following formula:

$$N = \left(\frac{.6745 \text{ Standard Deviation}}{\underline{1/}\ \% \text{ of the Mean}} \right) \text{Squared}$$

1/ This percentage will vary according to districts, being determined as already explained.

This study should be made for a number of years, because in different seasons the dispersion will vary. For instance, in 1926 in Arkansas when the conditions were rather uniform over the entire state, if a relative probable error of the mean of 1 per cent was allowed, we would have needed 2,135 reports; while in 1936, if this same accuracy was required, 4,161 reports would have been needed.

It was decided that all states should make a complete record of the editing practices followed on all items -- that this was very necessary in order to keep comparability from year to year -- thus helping those who are to follow to fully understand the way the reports had been edited in the past. Quite a bit of discussion was had on what procedure to follow in editing county bale estimates. It was brought out that this item is very valuable in some states as a guide to the current production. The representatives of the different states promised to send into Washington a complete statement of their editing practices, and it is hoped that from those statements a uniform method can be

adopted. It was felt that this was very necessary inasmuch as the Township Reporters' County Bale Estimates are being transferred out to the field. The Township Reporters' County Bale Estimates have never been edited and worked up; therefore, it will be up to the different state offices to do this and combine the results with the Aids.

The field offices requested that the County Bale Estimate question on the Field Ginners Card be discontinued. It was felt that there were not sufficient returns to make it usable. The request was granted and in the future the question will be left off the schedule. It was also felt that there were too many items being carried on the Cotton Schedules that were not being used. Particular reference was made to those relating to seasonal advancement. It was decided that at least half of them could be eliminated since charts submitted by the Chairman show they were highly inter-correlated. Additional study will have to be made of the items in order to determine which ones should be eliminated and which ones retained.

Mailing Reports to Washington:

It was decided that when the cotton surveys are worked up in the field offices, a copy of the raw data should be mailed immediately to the Washington office, if it was found that by doing this it would enable the data to get here sooner. In other words, if the data would be delayed by waiting for the Statistician's recommendations, the reports should not be held for his recommendations, but should be mailed immediately and the recommendations sent at a later date. If this practice were followed, it was pointed out that it would be necessary to code the envelopes containing the reports that went to the Secretary's office so that they will show exactly what they contain. Envelopes containing only the State Survey data should show a capital "S"; while those containing only the Statistician's Recommendations should show a capital "R". If the envelope contained both reports, it would show "SR".

Forms were discussed for keeping a record of cotton production indications (500 lb. G.W.B.) from the different sources. This was declared necessary in order to establish which of the indications make the best forecast.

H. L. Rasor discussed "District Forecasts," which he presented in a very forceful manner and pointed out that they are very useful in the Texas office as a check on production. He displayed district charts on all of the following: Acres Planted, Acres Harvested, Yield Per Acre, Condition, Percentage Ginned, and County Bale Estimates. He also presented a very complete set of forms that he uses, and it was decided that they could be made very useful in other states.

Boll Counts were discussed by Mr. Morgan. He brought out some very excellent points in his paper and it was decided that his recommendations should be followed.

1937 County Estimates from Available A.A.A. Data:

This discussion led to the decision that A. A. A. data should be given considerable weight as a basis for breaking down the Board's State Acreage into County estimates. However, it was voted that before any revisions are made on the 1937 County estimates, the Agricultural Adjustment Administration should be required to supply the various State Agricultural Statisticians with complete reports from all the counties of the following 1937 data:

1. Measured acres of the participants.
2. Reported acres of non-participants.
3. Acres of non-participants as adjusted by the County Committee.

It was further brought out that the County Agent's office had on file the following identical farm records:

1. Measured acres of signers.
2. Lint production of signers.

These two records should prove an excellent indication of county yield from which the county acres may be computed. Acres so derived should be checked against the A. A. A. county acreage data.

1938 Acreage:

It was realized that since every cotton farmer in the United States is going to be given a 1938 acreage quota by the Agricultural Adjustment Administration, some study should be made to determine how close he would report this quota to us on our July 1, 1938 I.F.A.S. schedules. It was therefore decided that the County Agents would be asked to furnish our state offices with about a 3 per cent sample of names of cotton farmers from their county. Along with the names and addresses, they will be asked to show the 1938 acreage quota. These farmers will be sent our July 1 I.F.S.A. schedule and their reported planted acreage will be listed along with their acreage quota and a percentage comparison made of the 1938 Reported Acres/1938 Acreage Quota. In addition, it was decided to make the same special survey of the A.A.A. list that was made last year. This includes the special list of farmers whose names were secured from the A.A.A. offices during 1935, 1936 and 1937.

Release of County Acreage, Yield and Production:

It was decided to release the County Acreage, Yield, and Production for the years 1928 to 1937, inclusive. Both planted and harvested acreages and yields will be released. The production will be in 500 pound gross weight bales. All acres and production will be rounded and no units will be shown for these two items. If it is found that some of the counties produce so little cotton that the rounding would cause too much error, such counties are not to be published, but are to be lumped and shown as "Others."

The question was raised as to whether the bias of our reporters had been changed. The charts submitted by the Chairman on both acreage and yield did not seem to indicate that the bias had changed; in fact, the yield on the charts looked plenty low for 1937 and the acreage looked plenty high.

A committee of statisticians consisting of Bryan, Schutz and Rasor presented a resolution which was approved, requesting that the Washington office allow the Cotton States more time between the due date in Washington of the General Report and the Cotton Report. It was felt that this will permit the Cotton States to make a more complete analysis of both reports.

The Chairman explained the method of computation of the County Acreage Quotas as set up by the Agricultural Adjustment Administration. An outline of this method was prepared by Mr. Harrell.

COTTON BOLL COUNT RESEARCH PROGRAM

J. J. Morgan,
Statistician, North Carolina

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To forecast accuratelythe cotton crop has always been a challenge to the Crop Reporting Board and to the State statisticians. It is necessary for the statistician to travel and to observe the crop closely in order to interpret the reported condition and weevil damage. To observe the crop closely it is necessary to get in the field and examine squares and bolls for weevil damage. The present method of counting bolls grew out of this experience.

The present method of sampling and the plant observations made are effectively summarized by Mr. V. C. Childs in C.E.M. 514-2 released on July 10, 1936. This memorandum is copied below to give a clear-cut picture of the present boll counting procedure.

DESCRIPTION OF PROCEDURE FOLLOWED BY THE WASHINGTON STAFF IN MAKING COTTON BOLL COUNTS 1930-1935

The following items have been covered by the counts and observations:

1. Date - State - Towns and mileage readings enroute. (For the purpose of locating the counts, the names and mileage readings of towns, State, district and county lines, etc. have been recorded in the first column of the field record book. These notes have been very helpful.)
2. Mileage at point where counts were made.
3. Number of plants in 15' of row.
4. Number of white or pink blooms in 15' of row.
5. Number of red blooms in 15' of row. (4 and 5 have been combined to show the number of fresh blooms, white and red.)
6. Number of large bolls (as large or larger than a 25¢ piece) in 15' of row.
    (a) Burrs
    (b) Open
    (c) Unopened
7. Number of small bolls in 6' of row.
8. Average height of plants.
9. Average number squares per plant.
10. Of 10 squares, number of squares punctured by weevil.
11. Number locks in 10 bolls.
12. Of 10 large bolls:
    (a) Number punctured by weevil
    (b) Number locks punctured in 10 bolls

13. Of 10 small bolls, number punctured by weevil.
14. Size of boll register CC's (Cotton Bollmeter).
15. Remarks (number of root rot infested plants, wilt, general prospects, etc.).

Counts have been made at not less than ten mile intervals, the selection of the field for counting being determined by the car speedometer record, thereby making it at random. The practice has been to make the counts in the first field encountered after the speedometer shows that a count is due. The car is stopped near the center of the field ordinarily, depending upon the convenience of parking and the means of entering the field. In order to increase the stability of the sample, counts have been made at five mile intervals in some States, and in two fields at each stop. This is considered good practice when time and funds permit.

The procedure in selecting the row upon which the counts were made has been as follows: Where the rows are parallel to the road, by walking to the 10th row and marking the row at that point. The 10th row has been rejected if it was clearly not representative, and either the 15th, 20th or 25th row selected. In other words, rows have been rejected, but selection has been limited to either the 10th, 15th, 20th or 25th rows. Frequently in low Delta country the side of the field next to the road is very rank in growth -- clearly not representative of the field as a whole. Along a ridge road, the rows near the road frequently are very poor. In such cases, the above plan of rejection and selection has been followed. After the row is selected, 15 feet are then measured off by the use of a five foot pole or steel tape. The usual custom has been to lay off this strip to the right of the first mark. If a pole is used, it is then put into the ground at the end of the 15 feet where it is convenient for measuring the height of plants. Where the rows are perpendicular to the road, the starting point in the row is established at the end of ten paces from the beginning of the row, with the power of rejection and selection exercised as indicated heretofore. In counting the number of plants, all of the stalks separately emerging from the ground are counted as plants. In other words, plants and not hills of cotton are counted. In counting blooms, under white or pink have been counted all blooms which are white in the morning or pink in the afternoon. Blooms which are pink in the morning are counted as red as they are the previous day's blooms. Blooms which are tending to become purplish are counted as red blooms in the afternoon, but they are not counted if they are very dark and dry in the morning. In 1934 separating blooms by color was discontinued and all fresh, moist blooms, including white, pink and dark red, with no parts of the petals dried from age, were counted. Ordinarily this excludes all dark and drying blooms that are evidently three days or more old. In counting all large bolls, bolls which appear to be mature, even though in some cases they may not be as large as a 25 cent piece in diameter, are counted. Open bolls are those which have opened to the point where the cracks in the burrs are at least as wide as a pencil. Under burrs have been recorded all bolls from which cotton has been picked. Bolls from which

cotton was falling are counted because if the cotton is there in sight, that is, not covered by dirt, it will be picked up. Burrs lying upon the ground upon the counter's side of the row are included. In counting large bolls, either unopened, opened or picked, positive production is being recorded. We do not, therefore, count bolls which have entirely rotted, open bolls in which the cotton was damaged by insects, weathering or so shriveled as to make harvesting impracticable.

At this point in the counting two paces are stepped off from the measuring pole to give the six feet upon which the count of small bolls was made. Under this classification are included all bolls too small or too immature to be counted as large bolls, down to a size where the boll shows through the forms. The average height of the plant is secured by sighting against the pole which is marked at one foot intervals. The number of squares per plant is estimated from observation and sample counts of plants, either on the sample strip or in the field at large.

At this point samples of bolls and squares are collected for examination as to the size of bolls and weevil damage. These examinations are made while driving to the point where the next count is to be made. In weevil territory ten large bolls have been collected for examination, with the proportion of burrs, open, and green bolls about the same as indicated by the count and by the appearance of the field. These have been selected at random from the bottom, middle, and top of the plants, by personal judgment, depending upon the proportion of the crop in the different parts of the plants. In many instances the top crop is too small to justify including more than one boll in the sample. From this examination the total number of locks, the number of locks damaged by weevil, and the number of bolls damaged in one or more locks are recorded. Ten small bolls and ten squares are collected at random, and examined for weevil damage. No small bolls have been collected when none are found on the 15 foot strip and very few are noted in the field. Squares have not been collected late in the season when they will not average as many as one per plant.

The Cotton Bollmeter has been used since 1934 to establish registers of the size of mature green bolls. Ten additional bolls have been selected for the Bollmeter measurements, instead of using the bolls which were selected for weevil examination. In selecting bolls for the Bollmeter register, special effort has been made to get only mature bolls, to avoid having the register affected by the earliness or lateness of the crop. The largest bolls have been selected from each plant from which samples were taken, but not necessarily the largest bolls in the field. The sample collected in this way probably would not be representative from the standpoint of weevil damage; hence the necessity for collecting two samples of large bolls.

In recent years a number of perfect open bolls have been picked and kept for weighting. The seed cotton was placed in small canvas bags, or paper bags if canvas bags were not available, and a record made on the bag, or a slip of paper on the inside of the sack, of the number of bolls picked and the district where gathered. The seed

cotton was weighed at some later date where scales were available, and after excessive dew or rain in the lint had evaporated. The number of open bolls picked from a field has varied from 0 to 10, depending upon the proportion of open bolls in the field. No cotton has been picked from fields when only a small number of bolls are open. These pickings have been made primarily to supply general information regarding the number of bolls required to make a pound of seed cotton. The information has not been secured on an intensive scale.

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Study of the August data has showed that large bolls on 15 feet would not give a reliable forecast of yield per acre when used alone. Other factors such as the number of small bolls, blooms, size of bolls, and weevil damage were found to be very important in forecasting the crop from boll count data at the time of the year. When these factors were thrown in, the series was too short at the time the studies were made to test the validity of the results. For a few of the late cotton States, the correlation of large bolls and yield shows a negative relationship. The explanation of this is that the late years in the series have been high-yield years and the plants had developed a small number of large bolls at the time the counts were made.

The counts made during September showed a very good relationship between large bolls on 15 feet and final yield per acre, for most States. Small bolls and blooms had much less effect than in August but it was still necessary to correct for these factors in some of the later States. The analysis of the September counts showed that large bolls on 15 feet, size of bolls and weevil damage all were important factors in forecasting the final yield per acre. Now that we have from eight to ten years' counts available, we are planning to make a detailed analysis of the data. A study of these data will give some information in supplying an index of State yields but it will not furnish any information with respect to the dispersion within fields because of the lack of randomization and replication.

The method of making the counts, and the observations to be taken, evolved from a number of years of trial-and-error experience with more weight given to practical aspects of the problem than to sound sampling theory. Before expanding the work we should test some alternative methods of selecting the sample to be sure we are using a sound technique.

The procedure now in use in selecting the sample row upon which the counts are made may be severely criticized from a statistical standpoint. It is logical to assume that if we know beforehand what is representative of the field the sample itself will not give any additional information. One of the primary objectives in sampling is to get some idea of the variability of the universe in order to draw conclusions with respect to the precision of the sample. The Statistician is given the right to reject the 10th, 15th or 20th row when it

is "clearly not representative" and his rejection may be more often because the row is less than average than because it is better than average. Most statisticians have some preconceived ideas of the size of the crop and their judgment as to what is representative of a field may be unconsciously biased. This bias will fluctuate between months and years. The bias between counts made by two men is even more indeterminate. This method of selecting the sampling unit introduces a source of error over which we have absolutely no control.

It is well at this point to state our primary objective in making the boll counts. We wish to take a sample that will give a reliable index of the <u>change</u> in yield <u>from year to year</u>, in some cases by crop reporting districts and in all cases for the State as a whole. Our objective is not to get a sample that will reflect the absolute yield for the district or state. If we desired to determine the actual yield it would be necessary to give each field in the universe an equal chance of being included in the sample. This would mean that we should have a random sample of farms and a random sample of the fields on these farms.

In using the route method we set up a subuniverse of all cotton fields that come within a given distance of the road. We feel that the year-to-year change in this subuniverse is highly correlated with the change in the universe as a whole. This assumption has not been tested. With our universe defined as all fields adjoining highways, we are immediately confronted with the problem of selecting the particular highway on which to make the counts. Here again a random sample, of some undetermined length of highway, would give us the best theoretical sample. A subuniverse selected in this way would be widely scattered and discontinuous. The limited personnel and funds force us to select a judgment route that is continuous and improved to the extent that it will be passable from year to year. We again make an untested assumption this particular route will reflect the change in the universe as a whole.

With our subuniverse defined and with some of the basic assumptions made in using this type of sample, what is the best method of sampling this strip? One of the primary objectives of taking samples, as has been pointed out before, is to get an estimate of the variability of the phenomenon in which we are interested. In any one field along this strip, the variability is made up of variations between plants in the same row and variations between plants in different rows. It is obvious that one observation per field tells us nothing concerning the differences that may exist between rows or within one row. It will take at least two counts of some arbitrary length of row to tell us that variations exist within the same row. It will take at least two observations, one in each row, to find out if there is a difference between rows. If we had four observations, two random observations per row for two random rows, for a large number of fields along this strip, an analysis of these data would then show whether maximum information could be obtained by sampling more fields or by taking more observations within a given field. We could then expand the work in the right direction.

We have given some thought to a sampling scheme that would give us the essential information on which to base a boll count program. It will be necessary to hold the additional work required to a minimum and therefore it will be necessary to design carefully the research program that it may yield the maximum information with a minimum of extra work and travel. This program should be set up to give definite information on the most efficient length of row to be counted and the most efficient intervals between counts.

To test the various methods of sampling it will be necessary to set up rigid regulations concerning the selection of fields and the selection of sampling units within fields. The methods outlined below are submitted for criticism. If there is a field on both the right and the left when the count is due to be made, the field on the right will be selected. The car should be stopped at the first point at which it could be safely parked and the field entered at this point. If there is no cotton field on the right or left when a count is due, the count should be made in the next cotton field. Absence of a cotton field at the point the count is due will be found frequently. It will be necessary, therefore, to work out some randomized system of stopping to avoid sampling the approach sides of fields too often. The approach sides of fields, being adjacent to woods in many cases, may not give a reliable indication of weevil damage. One method of selecting the stopping point would be to stop when the speedometer showed .1, .2, .3, etc., and enter the field at this point. If the reading in tenths showed up within the first or last 10 rows (or 35 feet) of the field this point would be rejected and the field at the next tenth reading selected.

Next we need a procedure for selecting the sampling units within the field. The area to be sampled will exclude 10 rows, or approximately 35 feet, on all sides for border effects. No samples will be drawn from this excluded area. There are several alternative methods that could be used in selecting the sampling units. One procedure would be to draw two rows at random from 40 rows, or less, depending on the size of the field within the border. If the rows are parallel with the road, there would be no trouble in locating the two rows. By this procedure an area approximately 140 feet square, or slightly less than one half an acre is marked off. The points at which the counts are to be made on the rows selected could be determined at random by stepping off the rows to within five feet of the strip to be counted. The actual starting point of the count would then be found by measuring the additional five feet - the end of the measurement would be the starting point of the sampling unit. It would probably be more practical to select the samples within the rows systematically by randomizing for the first unit and to measure off a given distance for the second unit.

It would be well to give some thought to a sampling unit made up of two, three or four parallel adjacent rows. In this case the sampling unit could be made up of two ten-foot strips of adjacent rows; three five-foot strips in three adjacent rows, or four five-foot strips in four adjacent rows. If this procedure were adopted, it

would be necessary to locate only two random sampling units in the area to be sampled. This method probably would not give as accurate an estimate of error as the procedure first suggested but, on the other hand, it appears to be more practical. It would be possible to select the first sampling unit at random from four starting points, e. g., 10, 15 20, or 25 rows and then to project the second sampling unit a given distance from the first count. Would it be possible to get as much information from two samples from one field at 10-mile intervals as from one count per field made at 5-mile intervals? Does increasing the length of the sampling unit give sufficient additional information to offset the time required? In what direction should the sampling unit be increased, along one row or across two, three, or four parallel adjacent rows? A discussion of the many possible alternatives would bring out many valuable suggestions and we would then be in a position to test the alternatives that are practical as well as theoretically sound.

To test the advantage of a single-row sampling unit of varying length, e. g., 10, 20 and 30 feet, as compared with a sampling unit made up of two, three or four adjacent rows, we would need to know the actual production for the field. It will be impracticable to test the two types of sampling units in connection with the regular boll count trips. Statisticians who are interested in this problem and have the personnel available could test the various methods of sampling in a few fields convenient to the State office. Statisticians who are interested in this problem should submit specific recommendations with respect to length of row to be tested and method of selecting the sampling unit within fields. In this way we will have the benefit of the judgment of many statisticians in setting up a unified research program.

Mr. F. Yates, statistician for the Rothamsted Experimental Station, studied last fall the various indications used by the Board in forecasting the cotton crop. He pointed out that estimates based on ginnings alone for most States from October 1 to the end of the season were sufficiently reliable to warrant the elimination of some of the other indications. In view of this fact, are we making the most efficient use of our funds and labor by making extensive boll counts in early cotton States during the month of September? We need reliable independent objective check data much more on August 1 and September 1 than we do for later forecasts. Our ginning estimates are based on from 20 to 50 per cent of all gins. The reliability of this indication is obvious when compared with the small boll count sample. In setting up this State boll count program we should give careful consideration to the time of making the counts.

In planning the boll count routes to be followed from year to year, the statistician should have in mind the possibility of using boll count data by crop reporting districts. Within a short time we will probably be making forecasts by crop reporting districts and the boll counts should be made to fit into this scheme. Forecasts of cotton acreage and production by districts in Texas have been made for a number of years and they have provided a check on estimates made for the State as a whole.

HAY SEED GROUP CONFERENCE

J. H. Peters, Chairman

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The purpose of this group meeting was to make definite plans for participation in the surveys and field travel incidental to recommendations to the Crop Reporting Board on production of certain seed crops grown in only one or a few states. These seed crops and the states concerned are:

Crimson Clover Seed:	Tennessee;
Orchard Grass Seed:	Virginia, Kentucky, Missouri;
Kentucky Bluegrass:	Kentucky, Missouri, Iowa, Nebraska, and Minnesota;
Redtop Seed:	Illinois;
Meadow Fescue Seed:	Kansas, Missouri, Indiana, Texas, Oklahoma, New Mexico and California;
White Clover Seed:	Louisiana, Wisconsin;
Hairy Vetch Seed:	Oregon, Michigan.

Mr. Edler's experiences in many years of estimating seed production established: (a) the necessity for first-hand observations of the crops in producing areas, with the consequent time requirements, and (b) the value of contacts with key men, producers and tradesmen, judiciously approached and appraised.

In order that the field statisticians may have the benefit of Mr. Edler's technical knowledge and trade acquaintance, plans were made for Mr. Edler to accompany Crop Estimates field men on field travel this year as follows:

1. With Mr. Bryant, of the Kentucky office, from Louisville about June 16, into the Kentucky Bluegrass seed and Orchard Grass seed producing areas in Kentucky.

2. With Mr. Brittain, of the Missouri office, from Columbia about June 23, into the Kentucky Bluegrass seed area in northwestern Missouri, and thence

3. With Mr. Carl of the Iowa office, into the contiguous Bluegrass area in southwestern Iowa.

4. With Mr. Collins of the Kansas office, from Topeka on or about June 27 to the Meadow Fescue area in Kansas.

5. With Mr. White of the Illinois office staff, from Springfield, Illinois, on or about July 6, to the Redtop Seed area in Illinois.

There was a discussion of the desirability of segregating in the 1940 census data on certain grass seeds grown in limited areas; this segregation to be accomplished by instructions to enumerators to write in the kind of "other grass seed" in these areas, and by separate tabulation of the figures so designated. The feasibility of such a procedure was generally accepted, and decision reached to transmit such a request to the Bureau of the Census, indicating the crops to be so treated and the counties in which they are concentrated.

Mr. Andrews of Utah discussed the conditions under which alfalfa seed is grown in that state, and methods best adapted to making production estimates under those conditions.

Mr. Paxton of Arizona proposed a plan for collecting information on both early and late crops of alfalfa seed in his state.

Mr. Daniels of New Mexico sought further instructions on setting up a program for covering the Sudan Grass seed in that state.

Other statisticians took part in the meeting, not all of whom can be mentioned here.

SUGAR CROP GROUP CONFERENCE

J. S. Dennee, Chairman

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A group meeting of the Statists interested in the SUGAR CROPS was held. Mr. Dennee presided.

It was the consensus of opinion that the sugarbeet crop is moving along smoothly, and no suggestions or recommendations were offered concerning it.

Mr. Schutz, for cane sugar, recommended that the monthly forecasts for cane sugar, July 1 to October 1, be discontinued because of the inaccuracy of the forecasts in recent years and because of the general dissatisfaction of the Louisiana sugar industry with the forecasts; and for the further reason that the cane crop has not reached the stage before October 1 when reliable forecasts can be made in terms of sugar. Mr. Dennee had lately visited Louisiana and found, after conferring with parties engaged in the industry, that the forecasts July 1 to October 1 meant little or nothing to the industry. The consensus of opinion is that the probable sugar outturn is difficult, if not impossible, to forecast before October 1 because of the new varieties of cane introduced into Louisiana during late years, and the matter of sugar content of the cane is largely a matter of the weather during the few weeks immediately preceding harvest. The recommendation is of record for the consideration and action of the Washington office and it is hoped that some definite action will be taken on same before the crop reporting season begins for the 1938 cane crop.

ASSESSORS' CENSUS GROUP CONFERENCE

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Walter H. Ebling, Chairman

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The following memorandum grew out of the evening conference on the question of state assessors' enumerations. It was felt that the men who have such enumerations would like to know about the development of the various phases of the work in the other states, and it is for the purpose of getting such factual information that this study is proposed.

Out of the conference grew a summary table regarding this work which is now being checked and which will eventually be completed in this office. A copy will be furnished to you and to the states involved as soon as it can be completed. The states having assessors' reports have also agreed to exchange copies of their current books so that each may know more fully how the other is working at this problem.

The men representing the different states signed the following memorandum asking for a factual summary of existing work. They realize that little can be or should be done from Washington by way of controlling the state activities, but a factual summary of the work now being done would be worth while.

MEMO TO MR. CALLANDER:

At an evening meeting on Assessors' Reports at the St. Louis Conference attended by representatives from each of the 14 states now having Assessors' Reports, the group came to the following conclusions:

1. That assessors' data, where well collected, are the best annual data available on agriculture, but at present no one has full factual knowledge of this work outside of his own state.

2. That there has been no comprehensive and thorough effort to pool the experience acquired in this field by the various states, and that an attempt to acquire such information should be made as soon as possible, for the following reasons:

(a) That wider and more intelligent uses of such data are dependent upon fuller knowledge concerning them.

(b) That improvement in methods and procedures concerning the making of such enumerations is often dependent upon having such factual knowledge available to all of the statisticians involved.

(c) That it is desirable to have the enumeration of agricultural data by this method developed in additional states wherever possible, and in such new developments this factual information is indispensable.

We therefore recommend that a project be established to make a factual survey of the methods now used in making assessors' enumerations in the various states, and that this factual information when brought together in such a survey be made available to those in need of it.

Respectfully submitted,

Colorado	F. K. Reed	Nebraska	A. E. Anderson
Illinois	A. J. Surratt	N. Carolina	Frank Parker
Indiana	Minor M. Justin	N. Dakota	Ben U. Kienholz
Iowa	Leslie M. Carl	S. Dakota	Evan V. Jones
Kansas	H. L. Collins	W. Virginia	Samuel J. Gilbert
Minnesota	Paul H. Kirk	Wisconsin	Walter H. Ebling Chairman
Missouri	Alfred C. Brittain	Wyoming	Geo. Knutson

MISSOURI FARM CENSUS

Alfred C. Brittain

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The Missouri Farm Census is taken after June 1st and is turned over to the Agricultural Statistician by December 31st. The majority of the listings are received in the fall months. The appropriation for the Farm Census has never been large enough to do very much field travel or educational work with the assessors. The state calls conventions occasionally. One is tentatively scheduled for 1938, at which time the Cooperating Crop Reporting Service will take part. This situation has resulted in an enumeration which is about three-fourths complete. This varies by counties from no returns to some counties which send in a larger number of farms than is reported by the Assessor. The 1935 Census is the only measure of completeness which can be used under our present set-up. An exception is the eight important cotton counties which were surveyed aerially this year.

The Assessor is sent the number of farms reported by the 1935 Census and is urged to make as complete an enumeration as possible.

No check has been made on duplicate enumerations. It would seem reasonable that the number of duplications would be small since the acreages are recorded at the time the assessment is made. The assessor is instructed to secure the crop information from the operator, if possible.

I disagree with the suggestions for arranging the questions in the Census order. My conclusion on this point is based upon one year's experience in making a detailed farm survey covering fourteen states. It is further confirmed by the Sample Census work done this year. I do not believe it is at all feasible under the conditions existing in Missouri. What is needed is the smallest number of questions possible, simply stated in language readily understood by both the assessor and the farmer.

The question of rotating questions has some merit but is not altogether satisfactory in Missouri, due to varying degrees of incompleteness of the enumeration. The officials of the State Department agree with me on this point. In the future, if questions other than those on crop acreages are to be asked, they will be started one year before or in the year of the Federal Census and continued for a 5-year period.

In spite of the imperfections in the Missouri Farm Census, it is extremely useful in estimating state changes in acreage and in making county estimates which would otherwise be impossible. The dependability of the Farm Census is a result of the fact that the total return for any one year is in general a fairly good cross section of the county.

PEANUT GROUP CONFERENCE

Frank Parker, Chairman

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Several phases of the peanut problem were discussed. Two states require state licenses for peanut pickers-threshers (Virginia and North Carolina). Enforcement of these acts is difficult and of doubtful recommendation or value. The 1937 percentage returns from thresher operations varied from 30 to 80 per cent, as obtained by statisticians.

It was recommended that future schedules separate peanut types, especially Spanish and Runners. North Carolina and Virginia need "Virginias."

After considerable trial and field study, it is recommended that research be undertaken to determine ways and means of better determining the probable yield of peanuts -- prior to harvest. Also to determine the factors which affect yield. Usually heavy growth goes with lower yields.

It is thought that the federal law requiring thresher records should be continued, even though partial returns are the best in prospect. It offers a good indication of yield and a fair base for acreage. Production "per picker" is of no value.

Utilization schedule is good, but cannot be used before November for reliable results. Such schedules should be submitted to field for study and approval.

Schedules should be printed and folded to permit the use of window envelopes.

Peanut revisions should be similar to the tobacco revisions -- after picker schedule has been tabulated.

The general usage of "bags", "bushels" and "pounds" varies in different states, so a uniform measure cannot be used. Pounds is the best single base.

It was generally agreed that peanut growers are largely tenants, who are obviously poor reporters. This accounts for the difficulty of obtaining adequate reports on peanuts.

The use of the crop meter for acreage determination is probably limited to North Carolina and Virginia, due to the widely scattered acreages in other states. The uncertain utilization of the peanut crop prior to harvest involves a complication. As of September 1, the

growers' concept of production is worthless. Few have examined the crops at that time, and the growth is at its best. A rain may either make or ruin the crop available for harvest, as too much moisture results in the stems rotting, leaving nuts in ground at harvest.

SOYBEAN GROUP CONFERENCE

J. H. Peters, — Chairman

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Representatives were present from nearly all of the commercially important soybean states.

Mr. Pettet, of the Census Bureau, discussed the soybean questions on the 1940 census schedule and secured the reactions of the statisticians present from their experiences in the trial enumerations.

It was proposed that questions on the Rural Carriers' card be changed to harvested basis, i. e., "Acres harvested for beans," and "Acres harvested for hay"; and discontinue publication of acreage utilized for other purposes. The 1940 Federal Census questions will for the first time ask the acreage harvested for beans and bushels harvested thereon.

Mr. Surratt spoke on his experiences in assembling soybean marketing statistics in cooperation with the various elements of the trade. Mr. Surratt paid tribute to the cooperation given by the officials of the Soybean Processors' Association and its members. Very complete statistics of marketings of 1936 crop soybeans were asembled by joint efforts of Mr. Surratt and the Association's staff. There was a discussion of plans that are under way for extending the collection of statistics on marketings of soybeans to the other commercially important states. The value of this independent check on production was recognized, provided it is supplemented by sufficient information on the other items of disposition, i. e., seed used, international trade, and the quantity of raw threshed beans fed to livestock.

It was emphasized that all states concerned take active steps by September 1, 1938, to secure marketings of 1937 crop soybeans.

The decision was announced to make no August acreage utilization survey in 1938, and limit such surveys to the October survey made immediately preceding the November report. The factors entering into this decision were:

(a) The unanimous opinion that farmers do not know at the time of the August survey the uses they will make of their standing acreage.

(b) It is undesirable to schedule the same farmer twice in the same season by a special schedule and follow with nearly the same questions on the Acreage and Production card.

(c) Results nearly as good as by special survey can be had by average distribution of acreage use varied by observation and measurable relationships.

Further decision was announced that the acreage utilization schedules in Northern States will not be multilithed in Washington in 1938, but will be multigraphed in Northern field offices, subject to the condition that the questions uniformly include acreage harvested for (a) beans, (b) hay, and (c) acreage utilized for other purposes, including acreage grazed and plowed under.

Trade interest in quarterly stocks of soybeans on farms was explained by Mr. Surratt. Other states recognized feasibility of stamping quarterly stocks questions on their crop report schedules. The printed Iowa schedule can be so adapted.

BROOMCORN GROUP CONFERENCE

J. S. Dennee, Chairman

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A group meeting, to discuss matters relating to the Board's broomcorn estimates, was held. Present: Mr. Callander, Dr. Sarle, Orr, Blood, Daniels, Reed, Childs, McPeek, and Mr. White for Illinois, representing Mr. Surratt who later came and took part in the discussion.

The criticisms of the Board's broomcorn reports by the broomcorn industry were discussed at some length, and Mr. Callander said his feeling is that if there is a demand for the report in the few individual states, there is no objection to the issuance of a report if there is a good basis for the figures; but that his reaction is that we should not publish estimates at all unless we can do better than we are doing. Dr. Sarle suggested that if we intend to continue our efforts to estimate broomcorn, the field men will have to get a better basis; that we ought to take the crop seriously or quit, and not make even a December report. Field men present concurred in Dr. Sarle's views on this point.

Blood and Daniels said that the dealers want the reports discontinued and that the growers want the monthly forecasts restored. Reed of Colorado favored a discontinuance of the Board's reports because of the difficulty of gathering dependable data in Colorado.

After considerable discussion, it was developed that appointment of a regional broomcorn man, to be located in the Oklahoma City office, might be a solution of the difficulty, the regional man, say in five months travel, to cover North Texas, Oklahoma, Kansas, Colorado and New Mexico; the Rio Grande Valley of Texas to be covered by Mr. Childs's office; and Mr. Surratt to continue to follow the crop in Illinois.

Dr. Sarle said to Mr. Blood (Oklahoma): "If we put a junior in your office for full time would it release enough energy to enable you to do the job?" And Mr. Blood replied that it would be a very difficult task in connection with making county estimates of crops, and that he did not believe he could take on the task if it is to be a full assignment. It was figured that approximately $1500 would be required for travel. Dr. Sarle suggested that a junior be put on rather than an assistant, and roughly estimated that to set up a regional man to work from the Oklahoma City office on broomcorn would cost about $4,000, of which amount $3,000 would be charged against this project.

Mr. Orr thought it would be advisable to pursue this crop with a special man traveling three to four months, perhaps, per year, if we hoped to regain our former prestige with the broomcorn industry.

RICE GROUP CONFERENCE

J. S. Dennee, Chairman

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Mr. Schutz recommended that Question #2, on the Rice Market News Service Schedule Form HFS-1597, be enlarged so as to ask for receipts of rough rice by mills during the month by states, viz.: Arkansas, Louisiana, Texas, California; contending that if the question were changed as he recommends, the result would obviate the necessity of the State Statist circularizing his rice list to obtain this information as to rice moving to market, to meet the demand of the Washington office for data respecting monthly marketings, needed by the Price Division to weight rice prices. Satterfield joined in this recommendation, as did Mr. Dennee. It was concluded that Mr. Dennee would pursue this matter with Mr. Collier of Market News Service and get Collier's reactionto the recommendation.

Mr. Satterfield recommended that, to lighten the burden on the field offices, uniform schedules be adopted and used for gathering monthly data in the Gulf States, and in California if practicable, the uniform schedules to be multigraphed or printed in the Washington office and mailed to the field offices. At present Arkansas office is using eight schedules during the rice growing-season, some of which are similar to those in use by the Texas office. Mr. Schutz and Mr. Dennee joined in this recommendation and it was agreed that Mr. Satterfield is to send a set of his rice schedules to Schutz and Childs and Scott, so that each may offer his suggestions, after looking the schedules over, and make his recommendations for what he believes would be a suitable uniform schedule; the suggestions and recommendations to be forwarded to Mr. Dennee at Washington, who is to look over the suggestions and recommendations, and, if feasible, prepare a set of uniform schedules and submit to the field offices for ratification before final adoption.

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Group Conference Minutes: (Continued)

COUNTY CORN ESTIMATES FOR THE AAA

A. E. Anderson
Statistician, Nebraska

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The AAA Program has necessitated more accurate county estimates of acreage, yield and production of corn. The method of allocating State acreage to the counties varies, depending upon the material available and its reliability. Nebraska has an annual State Census of Agriculture and this is used as a basis for setting up county acreage. This Census has some incompleteness but we feel the degree of incompleteness, as a rule, is kept more or less constant from year to year. The Census for the current year's crops is taken during April and May. It affords a very good basis for estimating county planted acreage except in years when there is more or less abandonment of winter wheat after the Census has been taken. This abandoned acreage is planted largely to corn or some minor crop in eastern Nebraska, while in western Nebraska the shift may be to spring wheat or some grain such as corn, barley or oats.

Incompleteness in the State Census is kept more or less constant from year to year by maintaining a record by precincts of the number of farms and the total acreage in farms. This is checked immediately upon receipt of the State Census report of the precinct. If the total acres in farms varies but little from the past reports, it is accepted. If this is not the case, the precinct report is returned to the precinct assessor with the request that he complete the report. As a rule, very little editing is done except to correct obvious errors. When weather conditions are normal so that there is very little abandonment in winter wheat, and when such abandonment as exists is known by the time the assessor calls, subsequent changes are of minor importance. Under such circumstances, the State Census data furnish a most valuable basis for determining State planted acreage by a simple flat adjustment to the July 1 Board estimate of planted acreage for the State. It is also a simple matter at such times to make county estimates of harvested acreage in the autumn on the basis of abandonment indicated by the Rural Carrier Survey.

On the other hand, if weather conditions are abnormal and the abandonment of winter wheat is heavy, or if the amount of abandonment cannot be determined definitely at the time the assessor calls, the task of making county estimates becomes complicated and difficult. Such has been the situation in Nebraska for the past 4 years due to the unprecendented drought. In such cases it is necessary through various surveys such as the June Acreage survey, the September Rural Carrier survey, Corn Utilization inquiry and sometimes special surveys, to determine the shift from winter wheat not only to corn but to other replacement crops to arrive at a planted base that is consistent throughout the State. It is often necessary to work from a district basis to help localize the change and shifts in counties within the district.

County data indications from the various surveys are set up on a county outline map of the State. District changes are also set up on the map. By a study of these data plus personal knowledge gained in travel, county estimates of planted acreage are set up and adjusted to the district total. Similar procedure is used in determination of abandonment to arrive at county harvested acreage. Determination of abandonment has been simplified considerably by carrying both planted and harvested acreage on the September Rural Carrier survey. However, one of the difficulties in Nebraska arises from the fact that many farmers through-

out the State do not consider corn as being harvested unless it is harvested for grain. Consequently, much acreage pastured or cut for fodder is reported as abandoned and has to be adjusted on the basis of personal knowledge gained through travel and by detailed study of the survey data. In some cases a flat adjustment of counties to the State estimate may show more harvested acreage than planted acreage in those counties that have little or no abandonment. This difficulty may be avoided by setting up district estimates of harvested acreage and continuing the adjustment of counties within the district until a predetermined district total is reached.

Another method that was used in Nebraska a few years ago which was very promising was to make a check-up survey on the State Census in the fall to a sufficient number of farmers in each county who reported to the assessor. This survey provided three columns for each crop. The acreage reported by the assessor was placed in column 1. The farmer was asked to enter the planted acreage in column 2, if it was different from that reported to the assessor, and to report the harvested acreage in column 3. Increased work without additional help made it necessary to drop this survey which we felt was the most promising of all surveys in determining county planted as well as county harvested acreage.

Where corn is a major crop, it is not difficult to get dependable yield data from the regular monthly reports, corn utilization schedules, acreage and production survey and other special yield inquiries. In Nebraska a special yield survey, called the Final Yield Inquiry, has been made each year since 1914 to all lists of correspondents who are in position to report on yields, and the returns are ample for stability by counties. Yields, together with the number of reports, are spotted on a county outline map. All sources are then considered, as well as yields in adjoining counties, and an estimate is set down. Irrigated land yields are given due weight. Yields are adjusted by districts and corrected on the basis of Federal Census relationships. If the sum total of harvested acres times average yield by counties does not equal the State production, adjustment is made in yields to reach the State production.

USE OF A.A.A. DATA AS BASIS FOR COUNTY ESTIMATES OF CROP ACREAGES

C. J. Borum,
Statistician, Michigan

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The experience of this office with the earlier programs of the A.A.A. indicated that little or no confidence could be placed in the county figures as originally submitted. This was particularly true for counties where production of wheat and hogs was not of considerable commercial importance.

About a year ago, we prepared new estimates of wheat acreage and production for use by the A.A.A. In making those estimates we used the final 1930-35 A.A.A. data as one of our indications. When we were recently requested to prepare county estimates of acreage and production of wheat and potatoes, we did not make use of the soil conservation data for 1935 and 1936 as we lacked confidence in the data and doubted if the indications would be worth the time it would take to derive them.

Neither Oregon nor Washington has any assessors' crop acreage figures, and for that and possibly other reasons county estimates have not been prepared except when requested by the A.A.A. With the increasing number of requests for county estimates on acreage, yield, production, prices, and income, we have been desirous of developing some economical method of arriving at county estimates. After the receipt of the memorandum requesting this office to prepare a paper on the use of A.A.A. data, we equalized the Oregon 1935 and 1936 A.A.A. acreage data to the census all crop land base. That permitted making comparisons of the absolute acreages and also changes in acreage by counties and for the State as a whole. It was possible to obtain the indications of acreage for corn, winter wheat, spring wheat, oats, barley, rye, potatoes, and grain hay. We found that for the State as a whole the sum of the above mentioned crops for 1936 indicated a 10 percent decrease compared with the official estimate of a 6 percent increase. We also found that the sum of the 1936 equalized data needed an upward adjustment of nearly 6 percent in order to agree with the official estimate, while the 1935 equalized total needed a downward adjustment of about 12 percent in order to agree with the official estimate. For those reasons we were rather skeptical of the reliability of the change in acreage that might be indicated for the counties. When the indicated changes for a given crop were placed on maps, we found many inconsistencies, and our skepticism was increased. As an example, the total acreage of the crops mentioned above showed a 9 percent increase in Washington County compared with very material decreases for four of the adjoining counties. We have thought of several possible explanations of the discrepancies between counties and for the State as a whole, but time does not permit of their being discussed now. Inasmuch as the 1936 data were on a report-of-performance basis, we thought that they might be of some value in an absolute sense. It is interesting to note that the equalized figure for all wheat in Oregon for 1936 is about 1,040,000 acres, compared with the official estimate of one million acres harvested. When the equalized wheat acreages were plotted against the independently prepared county estimates made for the A.A.A., a surprisingly close relationship was shown. Similar data for potatoes were plotted but the relationship is very poor as might be expected from the State total equalized figure of about 30,000 acres, compared with the official estimate of 43,000 acres.

From the study of these two crops, it would appear that crops commonly grown in fractional acres tend not to be reported on the A.A.A. performance sheet.

In order to test out our theory on another State, we equalized the 1936 wheat and potato data for Washington and plotted the computed acreages against the county estimates previously made for the use of the A.A.A. It is interesting to note that for wheat the equalized acreage was 2,130,000 acres compared with the official estimate of 2,164,000 acres harvested. As with Oregon, the county figures lined up quite well on the dot chart when comparisons were made with the estimates made previously. We found that for potatoes the equalized figure for 1936 was about 25,600 acres compared with the official estimate of 45,000 acres harvested. When we plotted the individual county acreages against the estimates, we found no consistent relationship; as a matter of fact, the dispersion was even greater than for the State of Oregon. It would, therefore, appear that the equalized A.A.A. data are of very little value as a basis for making county estimates for those crops that are grown in fractional acreages, but are of considerable value for estimating crops commonly grown in relatively large acreages, such as wheat. It is possible that when the 1937 performance data become available the ratios of change may be of considerable value even though the absolute acreages may be of little or no value.

It is believed that year-to-year changes in administrative rulings and administrative practice in reporting performance will result in noncomparability of the data from year to year. Nevertheless it is possible that the A.A.A. acreage data may in the future be a better basis for making county estimates than we have had in the past in those States where assessors' farm census data are not available.